"A STUDY ON LONG TERM CONTROL OF INTRAOCULAR PRESSURE IN PATIENTS UNDERGOING SMALL INCISION CATARACT SURGERY WITH TRABECULECTOMY"

DISSERTATION SUBMITTED TO

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

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in partial fulfillment of

the requirements for the degree of

M.S (OPHTHALMOLOGY)

(BRANCH-III)

TIRUNELVELI MEDICAL COLLEGE

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CERTIFICATE

This is to certify that this Dissertation titled **"A STUDY ON LONG TERM CONTROL OF INTRAOCULAR PRESSURE IN PATIENTS UNDERGOING SMALL INCISION CATARACT SURGERY WITH TRABECULECTOMY"** is a bonafide original work done by **Dr.N.NANDINI**., during the period of her postgraduate study from 2016-2018 in the Department of Ophthalmology, Tirunelveli Medical College, Tirunelveli – 627011, in partial fulfillment of the requirement for the award of M.S degree (Branch III) in ophthalmology examination of the Tamilnadu Dr.M.G.R Medical University will be held in May 2019.

DR. S.M.KANNAN, MS.,MCh,
Dean
Tirunelveli Medical College,
Tirunelveli-627011.

CERTIFICATE

I hereby certify that this dissertation entitled **"A STUDY ON LONG TERM CONTROL OF INTRAOCULAR PRESSURE IN PATIENTS UNDERGOING SMALL INCISION CATARACT SURGERY WITH TRABECULECTOMY"** submitted by **Dr.N.NANDINI** to the faculty of ophthalmology, The Tamil Nadu Dr. M.G.R Medical University, Chennai in partial fulfillment of the requirement for the award of M.S degree in Ophthalmology (Branch III), is a bonafide research work carried out by her under my direct guidance and supervision.

DR.V.RAMALAKSHMI, M.S.,
Professor & Head of the Department
Department of ophthalmology,
Tirunelveli medical college
Tirunelveli

CERTIFICATE

I hereby certify that this dissertation entitled **"A STUDY ON LONG TERM CONTROL OF INTRAOCULAR PRESSURE IN PATIENTS UNDERGOING SMALL INCISION CATARACT SURGERY WITH TRABECULECTOMY"** submitted by **Dr.N.NANDINI** is a bonafide research work carried out by her under my guidance.

DR.D.ANANDHI M.S., D.O., F.I.C.O
Assistant Professor
Department of ophthalmology,
Tirunelveli medical college
Tirunelveli

DECLARATION BY THE CANDIDATE

I solemnly declare that this dissertation titled **"A STUDY ON LONG TERM CONTROL OF INTRAOCULAR PRESSURE IN PATIENTS UNDERGOING SMALL INCISION CATARACT SURGERY WITH TRABECULECTOMY"** is a bonafide and genuine research work carried out by me under the guidance and supervision of **DR.D.ANANDHI M.S., D.O., F.I.C.O,** Assistant Professor, Department of ophthalmology, Tirunelveli medical college, Tirunelveli.

Place : Tirunelveli
Date :

Dr. N. NANDINI,
Post Graduate Student,
Department of Ophthalmology
Tirunelveli Medical College,
Tirunelveli.

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TIRUNELVELI MEDICAL COLLEGE

INSTITUTIONAL RESEARCH ETHICS COMMITTEE
TIRUNELVELI, STATE OF TAMILNADU, SOUTH INDIA PIN 627011
91-462-2572733-EXT; 91-462-2572944; 91-462-2579785; 91-462-2572611-16
online@tvmc.ac.in, tirec@tvmc.ac.in; www.tvmc.ac.in

CERTIFICATE OF REGISTRATION & APPROVAL OF THE TIREC REF NO: 966/OPTHAL/2017

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DEPARTMENT & INSTITUTION: TIRUNELVELI MEDICAL COLLEGE, TIRUNELVELI

Dear, Dr.N.NANDINI, MBBS., The Tirunelveli Medical College Institutional Ethics Committee (TIREC) reviewed and discussed your application during the IEC meeting held on 10.03.2017

THE FOLLOWING DOCUMENTS WERE REVIEWED AND APPROVED

1.	TIREC Application Form	☐
2.	Study Protocol	☐
3.	Department Research Committee Approval	☐
4.	Patient Information Document and Consent Form in English and Vernacular Language	☐
5.	Investigator's Brochure	☐
6.	Proposed Methods for Patient Accrual Proposed	☐
7.	Curriculum Vitae of the Principal Investigator	☐
8.	Insurance /Compensation Policy	☐
9.	Investigator's Agreement with Sponsor	☐
10.	Investigator's Undertaking	☐
11.	DCGI/DGFT approval	☐
12.	Clinical Trial Agreement (CTA)	☐
13.	Memorandum of Understanding (MOU)/Material Transfer Agreement (MTA)	☐
14.	Clinical Trials Registry-India (CTRI) Registration	☐

THE PROTOCOL IS APPROVED IN ITS PRESENTED FORM ON THE FOLLOWING CONDITIONS

1. The approval is valid for a period of 2 year/s or duration of project whichever is later
2. The date of commencement of study should be informed
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Registrar, TIREC
Tirunelveli Medical College, Tirunelveli – 627011
State of Tamilnadu, South India

Dr.J.Suresh Durai, MD
Member Secretary, TIREC
Tirunelveli Medical College, Tirunelveli – 627011
State of Tamilnadu, South India

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This is certify that this dissertation work title **"A STUDY ON LONG TERM CONTROL OF INTRAOCULAR PRESSURE IN PATIENTS UNDERGOING SMALL INCISION CATARACT SURGERY WITH TRABECULECTOMY"** of the candidate **Dr.N.NANDINI** with registration Number **221613251** is for the award of **M.S.** Degree in the branch of **OPHTHALMOLOGY (III).** I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion page and result shows **6 percentage** of plagiarism in the dissertation.

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Instances where selected sources appear:

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ABBREVIATIONS

1. IOP - Intraocular pressure
2. DNA - Deoxyribonucleic Acid
3. PACG - Primary Angle Closure Glaucoma
4. POAG - Primary Open Angle Glaucoma
5. SOAG - Secondary Open Angle Glaucoma
6. SACG - Secondary Angle Closure Glaucoma
7. MMC - Mitomycin C
8. S - Phase - Synthesis Phase
9. AC - Anterior Chamber
10. BSS - Balanced salt solution
11. 5-FU - 5-Fluorouracil
12. ECCE - Extra Capsular Cataract Extraction
13. SICS - Small incision Cataract Surgery
14. PCIOL - Posterior Chamber Intraocular Lens
15. AGM - Anti Glaucoma Medication
16. PAS - Peripheral Anterior Synechiae
17. SCH - Suprachoroidal Haemorrhage

1. INTRODUCTION

Glaucoma is a leading cause of irreversible blindness throughout the world. WHO statistics indicate that glaucoma accounts for 13.5% of blindness worldwide. It is the second most common cause of bilateral blindness[1].

Glaucoma is not a single disease process, It is a large group of disorders characterised by diverse clinical and histopathological manifestations. Glaucomatous optic neuropathy causes progressive loss of visual field, with or without increase in IOP that leads to total irreversible blindness.

The disease is asymptomatic initially, so management requires awareness creation, screening, early detection and proper treatment. Detection depends upon the ability to recognise early clinical manifestations of various glaucomas. Appropriate treatment requires understanding of pathogenic mechanisms involved, as well as proper knowledge of drugs and surgeries that are used to control intraocular pressure.

2. HISTORY OF GLAUCOMA SURGERY

Many new glaucoma surgeries have been devised since 1856. Von Graefe in 1856 introduced iridectomy as a surgical method for treatment of acute glaucoma. Two years later, De Wecker introduced sclerotomy as a procedure for chronic glaucoma. In 1900, internal filtration (cyclodialysis) was developed. In 1932, ciliodestruction was introduced as a glaucoma surgical procedure. The four approaches, relief of pupillary block, external filtration, internal filtration, and ciliodestruction, are still the basic techniques of glaucoma surgeries. There have been two basic approaches to lowering eye pressure surgically: increase outflow and decrease inflow of aqueous humour. Majority of surgeries were introduced in the 1960s.[2]

Trabeculectomy was first introduced by Cairns in 1968[3]. It is the most effective glaucoma surgery in terms of intraocular pressure reduction but carries its own limitations. Non-penetrating glaucoma surgeries emerged at the same time trabeculectomy was presented, but they are not used as commonly as trabeculectomy. Molteno introduced the first effective shunt and followed by others. Since 1995, surgeries that consisted of new implantable devices including SOLX, iStent, and Ex-PRESS shunt were introduced.[2]

3. FILTRATION TECHNIQUES

Filtration technique for glaucoma can be broadly classified into

A. Full thickness filtration surgeries
   - Sclerectomy
   - Iridenclesis
   - Trephination
   - Thermal sclerostomy
   - Laser sclerostomy
   - Internal sclerostomy

B. Partial thickness filtration surgeries
   - Trabeculectomy
   - Trabeculotomy

C. Glaucoma drainage devices
   - Setons
   - Shunts and valves

D. Non penetrating filtering surgeries
   - Sinusotomy
   - Ab externo trabeculectomy
   - Deep sclerectomy
   - Viscocanalostomy[4]

4.TRABECULECTOMY

This is the most widely performed glaucoma surgery. The various pathways adopted by the aqueous to drain in trabeculectomy are

- Filtration through sclerostomy around the margins of the scleral

  flap into the subconjunctival filtering bleb
- Filtration through the outlet channels in the scleral flap to the subconjunctival space
- Aqueous flow into the cut ends of Schlemm's canal into the collecting channels and episcleral veins
- Aqueous flow into the cyclodialysis cleft between the ciliary body and sclera.

1. Preparation Of The Patient

Pilocarpine should be withdrawn 2-3 weeks prior to surgery[5]. Pilocarpine increases permeability of the blood aqueous barrier, thereby increasing post operative inflammation which hastens bleb failure. It causes irreversible miosis.

Prostaglandins should also be stopped if used previously as they can aggravate surgically induced inflammation.

Discontinuing beta blockers prior to surgery is recommended so that postoperative aqueous flow is sufficient to form and maintain a functional bleb[6].

Topical broad spectrum antibiotics should be started 3 days before surgery.

T. Acetazolamide 250 mg twice daily is advocated a day before surgery for all patients except in whom the drug is contraindicated e.g. sulpha allergy.

Sedatives like diazepam should be given on the night before surgery to reduce the anxiety of the patient.

Intravenous mannitol 20% in the dose of 1gm/kg body weight is given atleast 30 minutes before block. The use of hyperosmotics controls the IOP and an eye with controlled IOP is less vulnerable to sudden decompression, snuff out, or expulsive haemorrhage. In angle closure patients, it allows the lens to fall back, and permits a deeper chamber for instrument manipulation. In patients with compromised renal function or with cardiac disease, Mannitol is avoided.

2. Consent

Patients must be clearly explained the risk and benefits of the surgery, in the language they understand. They must be explained that glaucoma surgery will only at best preserve their vision and at no time improve it. The patient must be warned about the possibility of a drop of about 1 line

of corrected visual acuity after trabeculectomy.[5,7] They should also be explained that glaucoma surgery will hasten the progression of cataract and rarely they may have loss of vision (snuff out phenomenon), in case of advanced visual field defects.

3. Anaesthesia

Peribulbar or sometimes subtenon injections are sufficient to perform a trabeculectomy. General anaesthesia is only required for children or in cases with extensive scarring which would necessitate a prolonged dissection. The use of retrobulbar or peribulbar injection has been documented to increase the IOP by 20 mm Hg in 10% eyes, and by 10 mm Hg in 35% of glaucomatous eyes.[8]

Patients with advanced visual field compromise are given a lesser volume of the peribulbar injection. The intraocular pressure spike induced by the sheer volume of the local anaesthetic injection can wreak havoc on the compromised optic nerve head circulation. Epinephrine in the injection should be avoided, since it can cause vasoconstriction of the small vessels supplying the already compromised optic nerve head.[9]

In the presence of advanced glaucoma subtenon or topical anaesthesia in the form of 2% lignocaine jelly, 0.5% Paracaine eye drops can be used.[10,11]

4.TECHNIQUE

A. Site Of Filtration Area

The preferred site is superior and nasal since it leaves adequate space on the temporal side for repeat surgery. Superior limbus site is preferred as the bleb is snugly covered by the lid, which protects and hides it's unsightly appearance. Inferior trabeculectomy should be avoided as the incidence of endophthalmitis increases with an inferiorly located bleb 7.8% per patient /year, which is 6 times the risk after superior trabeculectomy, especially if concomitant antimitotics are used. [12,13]

Buphthalmos or advanced glaucoma are conditions where the disease may not permit enough way to repeat the trabeculectomy. A truly superior site, centered at 12'O clock position is preferred in these conditions, as it gives the best exposure.

B. Bridle suture

The conventional superior rectus suture placed 10-15 mm behind the limbus can give rise to a haematoma, which by releasing growth factors facilitates healing at the filtration site. Blood contains many growth factors, which promote healing thereby contributing to bleb failure.[6] In a limbal based conjunctival flap, the superior rectus traction suture makes conjunctival suturing difficult. To avoid these complications, a clear corneal traction suture is preferred. The ideal suture depth is till 3/4th of

the corneal thickness. It is placed 1 mm from limbus and the pass is at least 4-5 mm wide. The suture material is either 7-0 or 8-0 silk or nylon. On the other hand, the suture for superior rectus bridle can be a 4-0 silk or even simple autoclaved cotton thread.

C. Conjunctival incision

Rough handling of conjunctiva entails the risk of buttonholing and also subsequent release of inflammatory mediators, which often herald early death of the filtering bleb. The conjunctival flap can either be limbal based or fornix based.

Studies which compared extracapsular cataract surgery combined with trabeculectomy with phacotrabeculectomy found that the use of limbal or fornix based flap resulted in equivalent lowering of IOP. [14,15,16]

Difference between two conjunctival flaps. (Table 1)

	Limbal based	Fornix based
Location	At the limbus	8 mm behind the limbus
Conjunctival incision length	Longer	Shorter
Scleral and conjunctival handling	More extensive, button-holing more common	Less
Haemorrhage	More	Less

Exposure of operating field	Not so well	Better
Scleral flap dissection	Difficult	Easier
Mitomycin application	More cumbersome	Easier
Releasable suture placement	Technically more difficult	Technically easier
Surgical time	Longer	Shorter
For combined surgery	Cumbersome	Easier
Wound leak	Risk minimal	Potential risk
Bleb morphology	Overhanging bleb	Posteriorly directed bleb
Bleb massage postoperatively	Can be done confidently	To do with trepidation
Astigmatism induced	Less	More, especially with bleb forming corneal sutures. Reverts after suture removal
Re-surgery	More difficult	Easier

An adequate scleral exposure is important, and this should govern the length of conjunctival incision. A minimum of 8-9 mm incision length is

required for a limbus based flap, however a 6-7 mm incision may be adequate if a fornix based flap is performed.

The conjunctival flap is created using a non-traumatic forceps like Pierce Hoskin's forceps and Westcott's scissors, taking care not to buttonhole the conjunctiva.[17] The chance of buttonholing increases manifold in repeat surgeries, or post cataract surgery. In repeat surgeries, where the conjunctiva is scarred, a fornix based flap is preferred.

The dissection is done beneath the flap with the Westcott scissors, just short of the superior rectus suture. This also allows placement of Mitomycin sponges till the posterior edge of the cleared subconjunctival space, away from the cut ends of the conjunctiva and finishing just short of the superior rectus insertion.

D. Tenonectomy

Some surgeons advocate tenonectomy can aid in achieving lower IOP,[18,19] whereas others concluded that it has no beneficial effect.[20,21]Scott et al described that tenonectomy had an etiological role in the development of encysted blebs. A comprehensive study from Turkey sought to prove that leaving behind a thick Tenon capsule in young patients, in Mitomycin-C augmented trabeculectomy would prevent bleb leaks. However, they found that over a 2 year follow up avascular thin-walled bleb still formed in 84% eyes., shallow anterior chamber occurred in 31%, hypotony in 16 %,

and endophthalmitis in 2%. Thus even a thick Tenon's capsule was no safeguard against MMC complications. [22]

E. Haemostasis

Blood releases many healing factors, which would unfortunately also cause conjunctival and scleral scarring thereby precipitating and aggravating bleb failure. Thus, meticulous subconjunctival and episcleral haemostasis is not only essential for adequate exposure and dissection, but also to ensure longevity of the bleb. A wet field cautery is ideal, Inadvertent use of Tadworth ball cautery can cause scleral shrinkage, thus making it difficult to close the scleral flap without tension. Scleral collector channel veins are difficult to coagulate, initially cauterise them lightly, and further check the ooze with gentle pressure by a swab stick or sponge.

F.Scleral flap dissection

A rectangular or a triangular flap in dimensions of 4-4.5 x 4.5 - 5 mm (rectangular) or 4.5-5 x 3.5 mm(triangular) can be made. The base of the triangle rests at the limbus. A Bard Parker handle, a 11 number blade, a disposable cutting knife or a diamond knife can be used to create the flap. The tip of the triangle or one corner of the rectangle is lifted with a non toothed forceps (Kelman McPherson forceps). A lamellar cleavage plane

is dissected with a Crescent blade keeping the plane of dissection at 1/2 to 2/3rd depth of the sclera.

The dissection is carried on till one crosses the blue grey barrier where the white scleral fibres merge into the grey zone. The white, opaque sclera with crisscrossing fibres merges into a grey band of parallel fibres, which overlies the scleral spur. Anterior to this lies the transparent corneal tissue. The junction of the posterior border of the blue grey zone (trabecular band) and the sclera is the external landmark for the scleral spur. The dissection is further carried on into 1 mm of clear cornea. The Schlemm's canal is situated anterior to the circumferential fibres of the scleral spur.[17]

Similarly a straight scleral incision can be made about 4-5 mm from the limbus and dissect a scleral pocket, as that of manual small incision cataract surgery. [23] The two side incisions are then cut with a disposable blade, keeping the flat of the Crescent blade as a support on the base. The scleral flap should neither be too thick as it will offer high resistance to aqueous flow, nor too thin because then the chance of flap dehiscence would increase, or the aqueous seepage through the flap may be excessive. A thin scleral flap can cause over filtration, hypotony, or the flap can become staphylomatous. Ideally, the scleral flap should be half the scleral thickness[17]. In case the first nick is too deep, direction can be changed to

make it less deep, for the rest of the dissection. It is better to have a flap of irregular thickness, rather than too thick or thin flaps.

G. Mitomycin application

Mitomycin is a bioreductive alkylating agent that undergoes metabolic reductive activation, and has various oxygen tension-dependent cytotoxic effects and arrests the cells in the S-phase by inhibiting cross-linking of DNA[24].

1. Indications for use of MMC / 5 Fluorouracil
   - Young patients, less than 40 years[25]
   - Secondary glaucoma- uveitic, neovascular, aphakic, post keratoplasty[25]
   - Prior failed trabeculectomy.
   - High preoperative intraocular pressure, more than 35-40 mm Hg at presentation. However, PACG patients, prior to peripheral iridotomy are an exception to this rule. The pressures in these cases get partially controlled with iridotomy. If such high pressures persist after a patent iridotomy then MMC can be considered for primary use.

- Buphthalmic eyes - initially MMC was reserved for repeat surgery[26] but currently more surgeons are now using it as a primary modality[27].

2. Duration of application:

Mitomycin C 0.2 mg / ml, is applied for 3 minutes as standard MMC protocol. Duration beyond 3 minutes, increases the risk of hypotony and visual acuity loss[28,29].

In high risk cases like – repeat surgeries, uveitic and neovascular glaucoma 0.4mg/ml is preferred and applied no longer than 4 minutes. Khaw et al have documented that the maximum uptake of the drug is within 3 minutes after which it plateaus out[6].

3. Technique of application:

Merocel sponges are cut into multiple pieces. MMC is squirted onto cut pieces of the Merocel sponges. Excess Mitomycin is squeezed out with forceps, these soaked sponges are then pushed under the conjunctiva in all directions with the aim that contact with the cut edges of conjunctiva is avoided (to prevent retardation of healing). The larger area covered leads to a more diffuse bleb. After the requisite time limit, the sponges are removed, and freshly soaked sponges are then re-inserted for 30 seconds beneath the scleral flap. Subsequently these sponges are also removed and the area washed with running Ringer lactate.

4.Complications

- Cataract

Almost 20- 66% patients develop some lens opacity over a 3 year period post trabeculectomy. The addition of antimitotic drugs increases this risk[30,31].

- Avascular blebs, bleb leak
- Bleb dysesthesia

It is a term applied to the group of conditions caused by the cystic, overhanging or elevated blebs. These blebs lead to tear film irregularities, blinking problems, dellen formation, dry eyes and foreign body sensation[32].

- Hypotony
- Risk of endophthalmitis

The risk of endophthalmitis is higher with the use of antifibrotics. The incidence of blebitis varies from 0.8-7.5%, and increases with time, the mean onset usually being 3 years post trabeculectomy[33,34].

5. Alternatives to Mitomycin

I. 5-Fluorouracil - It is used as multiple postoperative subconjunctival injections or as a single intra-operative application[35].

II. Amniotic membrane

Use of human amniotic membrane implanted under the scleral flap / conjunctival flap has been reported to be equally efficacious and much safer than the use of MMC[36,37].

III. Other modalities

Beta irradiation, TGF Beta, photodynamic therapy, are the other modalities which have been effectively used to prevent bleb fibrosis[38].

H. Side port creation / paracentesis

After application of MMC, the anterior chamber is entered via a side-port incision. This is made with V lance similar to the one made during phacoemulsification except that the direction is never towards the centre of the chamber, instead it is tangentially directed towards 6'O' clock, parallel to iris. If the pupil is dilated, intracameral pilocarpine is injected from the sideport to produce miosis. One must ensure that the angle of the V lance is directed tangential and not perpendicular to the limbus. Entry with the tip being perpendicular may inadvertently damage the lens.

This sideport serves many important functions:

- Is used to titrate aqueous flow through the scleral flap before tying the scleral sutures.
- In advanced glaucomatous damage cases, paracentesis is used to perform a controlled decompression as the smaller side port entry

is self sealing compared to the larger sclerostomy incision. This controlled decompression is desirable to prevent "snuff out" phenomenon.

- It allows the anterior chamber to be reformed with viscoelastic or Ringer lactate solution in case the anterior chamber (AC) becomes shallow during the surgery.
- Titration of the bleb at the end of surgery can be done and a patent sclerostomy, with adequate aqueous flow can be ensured.

In case of persistent shallow chamber during the postoperative period, AC reformation is facilitated if the side port is already performed.

I. Sclerostomy

After paracentesis, the inner sclerostomy block is marked out with the blade in the dimension 1.5 - 2 mm by 3.0 mm, at the base of the hinge of the superficial scleral flap[39]. Anterior to the sclerolimbal junction (where the white sclera merges into the blue translucent zone) is the clear cornea. A bevelled entry at an acute angle to the scleral bed, with the tip of the 3.2 mm keratome is made just where the translucent zone merges into the clear cornea. One should not insert the keratome fully if one wants the inner sclerostomy dimensions to be only 2 mm long. A full entry is needed when aiming for a 3 mm wide inner sclerostomy. After entering with the keratome, the keratome is slowly withdrawn thereby ensuring a controlled

decompression. At least 0.5 mm of the scleral bed is left, on either side of the sclerostomy, so that when the superficial scleral flap is sutured, the sclerostomy margins are not exposed.

The sclerostomy block is cut with a Vannas scissors or size 11 number blade. The posterior edge (length of the rectangular block) nearer the apex of the flap is then cut with a horizontally angled Vannas scissors.

While using the Kelly Descemet membrane punch, a smaller sclerostomy of 1 -1.5 by 1.5-2 mm dimensions is made, which is more than adequate[40,41]. It creates a compact neat hole without any jagged margins, and gives controlled cutting at all times thus avoiding shallowing of AC. The initial entry is made with the keratome, the punch is then introduced through this incision, with the cutting side turned posteriorly towards the fornix, and 5-6 bites are taken. Each bite creates a 0.2 - 0.3 mm opening.

J. Peripheral iridectomy

Peripheral iridectomy is performed through the inner sclerostomy with a Vannas scissors and a single toothed fine forceps like Lim's or Pierce Hoskin's. The cut is performed keeping the scissors parallel to the limbus, so as to get a broad base. In order to avoid making too large an iridectomy with resultant glare and /or diplopia, the forceps is angled almost vertically down inside the sclerostomy. Keeping the forceps tangential to the sclerostomy's forniceal end can result in making a large iridectomy.

Avoid forcefully pulling out the iris as this may cause an iridodialysis and/ or lens damage. The rationale for performing an iridectomy is preventing iris incarceration into the sclerostomy and relieving the element of pupil block glaucoma. The iridectomy base should be wider than the inner sclerostomy opening.

K.Scleral flap sutures.

Scleral flap sutures regulate the aqueous outflow. Resistance to outflow is largely determined by apposition of the flap with the underlying sclera which in turn is determined by the suture position and tension. The flap maybe triangular, rectangular or trapezoidal in shape. The scleral flap sutured too tightly can dampen up the aqueous outflow and cause rise in IOP whereas too loose sutures can cause excess aqueous outflow resulting in ocular hypotony. In a triangular flap, the apex is tied with a non-releasable suture and the two sides are secured with two releasable sutures.

If the base of the triangular or the rectangular flap stops 1mm from the limbus, three sutures for triangular flap and 5 for rectangular flap are adequate. If the sites of triangular or rectangular flap reaches the limbus, then two additional sutures on either side of the limbus are required to safeguard against hypotony.

Releasable Sutures

1.Richard Wilson's technique[42]

- A preplaced corneal groove is created at the base of scleral flap 1-1.5 mm from the limbus.
- The first pass is taken from the groove and transverses diagonally beneath the superficial scleral flap and out through the scleral bed at the side of the superficial flap.
- Suture is then looped over the superficial scleral flap and re-enters the deep scleral flap to exit through the corneal side 0.5 mm away from the limbal edge of the scleral flap.
- The two ends are tied.

2.Kolker's modification of Cohen and Osher technique of releasable sutures[42]

- In this technique, the needle is passed into the sclera and the scleral flap. The needle is then passed through the base of the scleral flap beneath the conjunctival insertion and finally through the peripheral cornea.
- The releasable suture is tied with quadruple throw slip knot.

- Rectangular scleral flap is closed with two releasable sutures.
- Whereas in triangular scleral flap, it is closed with one permanent suture at the apex and one releasable suture on each side.
- A second pass of the needle is made into the basal cornea.
- The releasable sutures are released as and when required under topical anaesthesia in slit lamp. The sutures are released one at a time within 10-14 days of conventional trabeculectomy.

Complications Of Releasable Sutures

Windshield wiper keratopathy occurs due to rubbing of the suture ends on the cornea with lid movements. This is seen as a distinctive wedge shaped keratopathy that resembles the pattern left on a car windshield by the wiper blade[43]. Although this keratopathy resolves with release or trimming of the suture, there is a potential for infection and techniques have been described to avoid this complication. The persistent track left after trimming of the suture, also poses a risk of bleb infection. Other complications reported are epithelial abrasion and subconjunctival bleed following the release of the sutures[43].

L. Anterior chamber reformation

Viscoelastics may be used to reform the AC and check the blood ooze if any, after the scleral flap sutures have been tied. Injection of

methylcellulose is very beneficial in case of a post iridectomy bleed, as it limits the bleed and pushes the blood away from the sclerostomy cleft. Use of a viscoelastic has also been recommended by Wilson et al, who in a case control series found that viscoelastic use decreased the risk of complications[44].

M.Conjunctival flap closure

In a limbus based flap, incision is closed with continuous 8-0 nylon, or 8-0 vicryl, the edges of which are interlocked. The absorbable Vicryl induce more inflammation but is the suture of choice in children where conjunctival suture removal would necessitate another general anaesthesia. A round bodied needle is preferred, to avoid cutting through the conjunctiva. The superior rectus bridle suture is released at this stage, to allow for proper coaptation of the wound edges. Small closely spaced passes are taken in a running fashion. Interlocking of the suture is not necessary. The ends however are interlocked, tied on itself and not cut too short. A little longer end causes less irritation, a short end may stand up and rub against the lid and cause more discomfort. Too long a suture also leads to a corneal abrasion and should be avoided.

If antifibrotics are used or if the conjunctiva is very thin, tenon layer is sutured separately using interrupted 6-0 vicryl sutures.

For fornix based flap 10 zero nylon is the suture of choice. One or two sutures are placed at either end of the incision taking the bite from the anchored conjunctiva to the loose conjunctiva of the flap. These are called as the wing sutures. The conjunctiva is anchored to the limbus with 2-3 horizontal mattress sutures which involve intracorneal bites. The knots are placed to lie between conjunctiva and cornea in order to avoid irritation of the cornea.

N. Bleb Titration

At the end of the surgery, titration is done from the side port with a 24 or 26 gauge hydrodissection cannula (the blunt tipped fine bored disposable needle can be used for this purpose). A 2 cc syringe filled with Balanced salt solution or Ringer lactate is attached to this needle and AC is reformed through the side port. The bleb will be formed on table, thereby ensuring patency of the sclerostomy and adequate tightness of the scleral sutures. In addition water tightness of the conjunctival closure is checked.

5.COMPLICATIONS OF TRABECULECTOMY

Trabeculectomy provides a non-physiologic route for aqueous outflow and complications do occur. Timely detection and management of these complications is vital for good surgical outcome. These complications can be

1. Peroperative Complications

Most of the postoperative complications of trabeculectomy are related to per operative problems involving the conjunctival flap, scleral flap and inner block removal.[45]

A. Anaesthesia-related

Generally glaucoma surgery is done under local anaesthesia. It is advisable to stop anticoagulant therapy preoperatively to minimize the haemorrhagic complications[46].

Acute retrobulbar haemorrhage presents as proptosis associated with hardening of the eye, discoloration of lids and subconjunctival haemorrhage following local anaesthetic injection[47]. Elevated intraocular pressure (IOP) that occurs with retrobulbar haemorrhage can compromise blood flow to the optic nerve in advanced glaucoma.

Immediate measures has to be taken to treat it. Intravenous administration of 20% mannitol (1 g/kg body weight) and lateral canthotomy with lateral cantholysis to be done. Surgery should be deferred till the complete absorption of haemorrhage.

To avoid anaesthesia-related complications, topical anaesthesia can be given. In a comparative study of topical and retrobulbar anaesthesia for trabeculectomy, both procedures provided equally efficacious optimal operative conditions for surgeon and excellent pain control for the patient.[48] In another study lignocaine 2% jelly was compared with sub-Tenon's anaesthesia for trabeculectomy and it was found that patient comfort and surgeon satisfaction was similar in both groups.[49]

B.Conjunctival buttonholes

Tears or buttonholes in the conjunctiva and Tenon's capsuleare complications, the consequences of which are far greater than their size. They are difficult to treat and responsible for the failure of the surgery. The main reasons for their occurrence are poor visualization and use of inappropriate instruments. It is of utmost importance to handle the conjunctiva gently using non-toothed forceps. A limbus-based or a fornix-based flap is fashioned according to the surgeon's preference. Limbus-based trabeculectomy gives the advantage of a watertight closure; on the contrary, leaks are very common with a fornix-based flap[50].

However, the technique of creating a limbus-based flap requires creation of a conjunctival incision as posteriorly as possible; this makes the conjunctiva susceptible to tears. The fornix based flap provides a better

surgical view and exposure[51]. The important step in the management of conjunctival buttonhole

is immediate identification and management. The risk of inadvertent buttonholes is greatest in previously operated eyes that have extensive sub conjunctival scarring. Efforts must be taken to avoid the cut edges of the conjunctiva touching the antifibrotic agent used. If the tear is large and satisfactory watertight closure appears difficult, a new surgical site can be chosen. Direct repair of the buttonhole can be performed using a purse-string suture or single or multiple mattress sutures using a 10-0 Nylon suture on an atraumatic needle. All the conjunctival leaks should be closed before concluding the surgery. They may lead to hypotony, shallow anterior chamber and scarring of the bleb. Early postoperative wound leak was found to be a risk factor for failure of trabeculectomy in the fluorouracil filtering surgery study[52]. Wound leaks during the immediate postoperative period should be checked and managed promptly.

C. Scleral flap complications

Too thin or thick scleral flap both can produce complications. An adequate scleral flap depth during dissection is necessary to avoid tearing the flapin superficial dissection or premature entry in deep dissections. In case the flap tears, it may be sutured to the anterior limbal tissue and a new flap created more posteriorly and in a deeper plane. Scleral flaps are difficult to

repair in a predictable fashion. In case of total flap amputation at the only available site, a donor scleral flap reinforcement or a glaucoma drainage device may become necessary. Special care should be exercised in fashioning the flap in buphthalmic and highly myopic eyes. Visualization of dark uveal tissue through the scleral bed indicates very thin underlying sclera. Deeper dissections are prone to posterior premature entry. In these cases, balanced salt solution (BSS) or viscoelastic is injected to deepen the anterior chamber and a superficial lamella is dissected anteriorly into clear cornea. Other than the thickness, flap size is an important parameter; a large flap seems to produce more diffuse blebs. At present there is no conclusive evidence to suggest that the flap shape affects surgical results.

D. Intraoperative bleeding

Mild conjunctival bleeding during dissection is usually transient and stops spontaneously. Bleeding occurs more frequently in patients on oral anticoagulants, hypertensives and patients with increased capillary fragility. Significant subconjunctival haemorrhage may hamper visualization of scleral flap suture during argon suture lysis or may hinder bleb formation and may predispose to bleb failure. Scleral bleeding in the scleral flap is usually controlled by direct pressure with a cotton-tipped applicator or irrigation with BSS. Cauterization may shrink the tissue and result in poor closure; in view of this cauterization should be avoided for scleral bleeding. During iridectomy or inner block removal injury to the

major arterial circle of iris can cause bleeding. Irrigation or application of pressure stops the bleeding. If the bleeding persists one may have to close the flap and increase the IOP to stop the bleeding. Small hyphaemas are usually self-limiting. Larger hyphaemas require drainage via an AC paracentesis. AC bleeding was the most common peroperative complication (8%) in the collaborative initial glaucoma treatment study.[53]

E. Suprachoroidal haemorrhage

It is a rare complication of glaucoma surgery. The risk factors for this complication are aphakia, vitrectomised eyes, congenital glaucoma, pathological myopia, patients on anticoagulants and significant hypotony[54-56]. It is strongly associated with higher preoperative IOP[57]and long axial length[58]. Preventive measures in high-risk groups include IOP reduction by medications including hyperosmotic agents and releasing aqueous gradually through the paracentesis tract. Preplacing scleral flap sutures facilitates closure of the scleral flap without resulting in significant duration of hypotony. The risk is greatly increased in patients with raised episcleral venous pressure like Sturge Weber syndrome and in dural sinus shunts. Preventive sclerotomies should be placed in high-risk eyes[59]. Progressive shallowing of the AC, loss of red reflex, onset of pain despite adequate local anaesthesia and appearance of a dark posterior segment mass are signs of SCH. The scleral flap should be immediately closed and

intravenous mannitol administered to lower the IOP. In selected cases, sclerotomies are recommended to promote drainage of suprachoroidal fluid.

2. Early Postoperative Complications

The outcome of the trabeculectomy surgery is determined by postoperative care. The frequency of visits varies according to the IOP, AC depth and bleb characteristics. In the early postoperative period patient should be instructed to avoid strenuous activity and advised to use topical steroids and cycloplegics. In each postoperative visit, the examination consists of measurement of IOP, AC depth and evaluation of bleb characteristics.

A low-lying diffuse bleb with reduced vascularity, cystic changes, IOP in low teens, well-formed AC with tight conjunctival closure indicates an ideal bleb. Deviation from this picture suggests possibility of early postoperative problems[60,61].

A. High Intraocular Pressure With A Deep Anterior Chamber

- Tight flap closure

It is usually because of tight closure of the wound, however, Gonioscopy should be done to rule out obstruction to flow at the sclerotomy site. Obstruction is rare and is usually due to fibrin, blood, vitreous, iris or imperforate Descemet's membrane. The obstruction with fibrin and blood is transient, whereas obstruction with iris or vitreous needs intervention.

Tight flap closure is the common cause for raised IOP with deep AC. The goal of management here is to separate the edges of the scleral flap with digital pressure.[62]. This can be achieved by pressing on the sclera next to the flap with a cotton tip applicator or firmly compressing the globe with index finger over the lower eyelid while patient is looking upwards. The IOP, depth of the AC and height of bleb should be noted after the digital pressure. These measures may have to be repeated multiple times. If the IOP remains high, removal of the releasable suture or laser suture lysis can be considered. Releasable sutures placed at the time of surgery and their sequential release in the postoperative period is a useful technique[63-65]. These sutures provide tight closure of the wound in the immediate postoperative period and later allow IOP reduction with sequential release. It is mandatory to remove one suture at a time. Laser suture lysis is performed using the argon or diode laser. Multiple lenses have been described for this procedure – the Hoskins stalk lens, Ritch, Mandelkorn and Blumenthal[66-68]. The common feature among these lenses is their ability to compress the conjunctiva and underlying tissue; this facilitates the visualization of the suture. Most of the sutures can be cut using low energy and low exposures[69]. Longer exposure can cause conjunctival coagulation and hole formation. Both techniques are associated with complications such as flat anterior AC and wound leaks[70]. These methods are useful for a period of two to three weeks following trabeculectomy

without antimetabolites. With adjunctive use of antimetabolites such as MMC, the window period for postoperative titration with suture removal is extended to several months; this timeframe is somewhat shorter with 5-FU[70].

If the bleb remains flat with raised IOP in spite of digital massage and laser suturelysis, scarring at the episcleral surface is the cause for bleb failure. The failing bleb can be salvaged with 5-FU subconjunctival injections with or without needling of the bleb depending upon the extent of the scarring. The needling technique was originally described for encapsulated blebs, but was found to be very useful in failing blebs also[70-72].

- Bleb Encapsulation

Another important cause for elevated IOP with a deep AC is bleb encapsulation. It is also referred to as Tenon's cyst and it usually occurs during the second to fourth postoperative week as a tense, "tight-appearing" bleb. The bleb is firm with few or no microcysts. The IOP tends to rise with encapsulation but falls after two to four months. The reported incidence is 9–15% following trabeculectomy[73-75]. Temporary IOP reduction with medications such as aqueous suppressants is usually required. Bleb needling with antimetabolites is an option in case of sustained raised IOP. Failing all measures, a surgical bleb revision (partial/ complete cyst excision) or repeat trabeculectomy may be required,

especially in cases of multiloculated cysts. A prospective study showed that medical therapy using the aqueous suppressants was superior to needling of bleb in the management of encysted blebs[76]. Risk factors for encapsulation are use of limbal-based flap or long-term use of topical beta-blockers[77,78].

B. High intraocular pressure with shallow anterior chamber

Following trabeculectomy, shallow or flat AC can occur due to various reasons. Elevated IOP with shallow AC is mainly because of pupillary block, aqueous misdirection or suprachoroidal haemorrhage.

- Pupillary block

This should be considered first in the differential diagnosis of raised IOP with shallow AC. It may be difficult to differentiate from aqueous misdirection; however, the iris bombe caused by pupillary block usually is associated with a central AC deeper than the peripheral AC. The condition responds well to a laser or surgical iridectomy.

- Aqueous misdirection (Malignant glaucoma)

It is caused by posterior diversion and pooling of aqueous in the vitreous cavity. Sudden shallowing of the AC following conjunctival leaks, over filtration following suture removal may be the initiating event of the cascade leading to misdirection of aqueous. This shallowing causes alteration in vitreous volume and its compaction leading to an increase in

vitreous volume and reduced permeability of the aqueous through the anterior hyaloid[79,80]. This leads to progressive accumulation of aqueous in the vitreous cavity and uniform (central and peripheral) shallowing of the AC. Another recent hypothesis proposed that choroidal expansion contributes to the events causing anterior vitreal movement[81].

Intraocular pressure may be normal to high. Initial management consists of aqueous suppressants and cycloplegics. If medical therapy fails, surgical treatment is required. In aphakic or pseudophakic eyes, the anterior hyaloid can be disrupted with the Nd: YAG laser in combination with posterior capsulotomy. If the ciliary processes are visible they can be shrunk with the argon laser. These measures can reverse the events and establishes the normal aqueous flow and deepening of the AC. Incisional procedures may be needed in some cases. In the past, needle aspiration of the fluid vitreous was a commonly done procedure.[60] In the modern era it is preferable to do a pars plana vitrectomy with disruption of the anterior hyaloid face. The key to success here is establishing free flow of aqueous from the posterior chamber to the AC[82]. Relapse can occur in phakic eyes if disruption of the anterior hyaloid face was not sufficient. Long-term cycloplegic drops are needed.

- Suprachoroidal hemorrhage

Delayed postoperative SCH is characterized by abrupt onset of pain, nausea and loss of visual acuity. Examination shows a peripheral and central flat AC, loss of red reflex and appearance of dark brown dome-shaped choroidal elevations. Ultrasonography demonstrates blood in the suprachoroidal space. Serial ultrasound examinations are needed to evaluate the size of the haemorrhage and also the liquefaction of the clot. Drainage is usually done when the amount of haemorrhage is huge usually through an inferiorly placed sclerotomy with constant infusion of BSS in the AC.

C. Low Intraocular Pressure With Shallow Or Flat Anterior Chamber And Flat Bleb

Usual causes for this postoperative condition are conjunctival wound leaks, serous choroidal detachments and rarely, an inadvertent cyclodialysis cleft.

- Conjunctival wound leaks

Hypotony without a visible bleb suggests the possibility of a conjunctival leak and the Seidel's test usually localizes the site of the leak. The surface of the bleb and suture line should be tested for a leak. Management depends upon the size and position of the leak, the appearance of the bleb, depth of the AC and whether antimetabolites were used or not. Usually, in eyes with a deep AC and a well-formed bleb, a small leak along the suture

line heals well, either spontaneously or with conservative treatment. In eyes that receive antimetabolites, small leaks may not heal and surgical closure may be needed. Large leaks along the suture line need closure. Surface leaks are difficult to close surgically and conservative treatment should be tried. Conservative treatment consists of patching of the eye, aqueous suppressants and the use of antibiotic drops known to induce scarring such as gentamycin or tobramycin. If there is no response, various other techniques have been described like bandage contact lens,[83]collagen shield,[84]tamponade with Simmons shell[85]or symblepharon ring, tissue adhesives such as cyanoacrylate[86]or fibrin glue[87] and autologous blood injection[88]. In eyes that fail to respond, one may have to resort to surgical correction. The best way to avoid postoperative leaks is to meticulously close the conjunctiva peroperatively. It is strongly recommended to look for any leaks at the conclusion of the trabeculectomy and if there are any leaks they should be handled with appropriate measures.

- Serous Choroidal Detachment

The precipitating factor for the serous choroidal detachment usually is hypotony. The detachments may further reduce aqueous flow and start a vicious cycle. Most cases usually resolve on conservative therapy that consists of frequent topical steroids and cycloplegics with or without systemic steroids along with management of the event precipitating hypotony. If all measures fail, surgical intervention is necessary, especially

in cases of cornea-lenticular touch or large non-resolving effusions. Choroidal drainage is usually done under general or local anaesthesia. The eye is rotated upwards using an inferior corneal or rectus traction suture. Infero-nasal or infero-temporal quadrants are chosen for drainage, depending on the most dependent area of detachment. After incising the conjunctiva and Tenon's layer in a radial manner 5-6 mm away from the limbus, a radial scleral incision is made and slowly dissected to reach the suprachoroidal space. Escape of straw-colored fluid is seen on reaching the suprachoroidal space. During the drainage, AC deepening with BSS or viscoelastic should be done. Pressure on sclera near sclerotomy and passing a spatula between the sclera and the choroid through the sclerotomy facilitates drainages. Gentle cautery to edges of the sclerotomy helps in keeping it open allowing a continuous drainage of fluid. The conjunctiva and Tenon's layers are closed in layers. After several months complete resolution of detachment and cataract formation is seen[89].

D. Low Intraocular Pressure With Shallow Or Flat Anterior Chamber And Elevated Bleb

Excessive filtration (over-filtration) due to a loose scleral flap suture is the common cause for this postoperative complication. The condition usually resolves spontaneously. Treatment is recommended when the AC is very shallow or if hypotony is associated with large choroidal effusions.

Aggressive treatment with 1% atropine and pressure patching, with judicious use of aqueous suppressants to reduce the excess aqueous outflow, helps to deepen the AC. In non-responding cases surgical intervention may be needed. Deepening the AC with viscoelastic, air, or non-expansile concentrations of gas may be sufficient in some cases. Large choroidal effusions may need drainage. Persistent early hypotony can lead to chronic hypotony. Aggressive laser suturelysis or release of releasable sutures can also cause this postoperative complication.

3. Late Postoperative Complications

Late postoperative complications following trabeculectomy are mainly due to the long-term changes in the bleb characteristics. With the advent of antifibrotic agents such as 5-FU or MMC we are able to achieve lower target IOPs. However, late complications such as chronic hypotony, bleb leaks, blebitis and endophthalmitis are increased.

- Chronic hypotony

When hypotony (IOP of less than 5 mmHg) persists for more than three months it is called chronic hypotony. This can be associated with a drop in the visual acuity[90] and hypotony maculopathy. Maculopathy is characterized by choroidal folds, retinal striae and no edema[91]. Risk factors for this complication are young age and myopia[92,93]. These factors are mostly related to decreased scleral rigidity in the area of the posterior pole

and a tendency towards collapse in the presence of low IOP. Non-surgical interventions are tried before resorting to the surgical revision of the bleb. Commonly used interventions are soft contact lenses, bleb size reduction by cryotherapy[94] autologous blood injection with or without compression sutures,[95-97] and argon laser to the bleb. Surgical revision consists of closing the scleral flap or applying a scleral patch graft in cases of scleral dehiscence; this results in increasing the IOP and restoring the visual function[93-99]. Avoidance of hypotony altogether with primary surgery is the optimal procedure to avoid this long-term complication.

- Bleb leaks

They are detected with Seidel's test: the fluorescein strip is applied gently over the bleb and the eye is examined using cobalt blue illumination. If there is leak, unstained aqueous will be seen to flow surrounded by dark green fluorescein tear film. In the absence of spontaneous leak, gentle pressure can be applied and suspicious area of leak should be examined. A small hole may appear in thin-walled blebs, causing leak and inflammation. In blebs without antimetabolite use, these leaks can subside with conservative treatment which consists mainly of aqueous suppressants, broad-spectrum antibiotics and patching or soft contact lens application. During this period the patient should be instructed to watch for any symptoms of endophthalmitis. If the leak is large or not responding to conservative treatment, other modalities that result in closure of the leaks

should be tried. Reported modalities are cyanoacrylate glue, fibrin tissue glue, injection of autologous blood and surgical revision. When simple methods fail or the leak is complicated, surgical revision is recommended. A free autologous conjunctival patch graft and the procedure can usually done under peribulbar anaesthesia.

- Symptomatic blebs

The filtering blebs are reasonably tolerated and most patients are aware of "blister" and some patients report various degrees of discomfort. Symptoms are common with nasal or large blebs or blebs extending to the cornea. Symptoms can be associated with superficial punctate keratopathy, tear film abnormalities, dellen formation and ocular surface irregularities. Symptoms are mainly foreign body sensation and visual disturbances. Frequent use of artificial tears and ocular lubricants are recommended as initial treatment. If the symptoms persist, surgery should be considered for large blebs or overhanging blebs[100]. Compression sutures should be used to reduce the height of the large elevated bleb.

- Failing or failed blebs

Late failure of the blebs is mainly due to the fibrosis at the conjunctival and episcleral interface with a patent sclerotomy and rarely due to obstructed sclerotomy. Management depends upon the cause. External revision with needling using antimetabolites is the commonly

recommended procedure for bleb failure due to scarring. Internal revision with laser can be tried for sclerotomy obstruction. When these measures fail, repeat glaucoma surgery will be needed.[100]

- Bleb-related ocular infections

The presence of thin-walled blebs that is commonly seen with antimetabolite use is a risk factor for bleb infections. The infection usually starts in the subconjunctival space and spreads to the AC and the vitreous cavity. Onset of infection can vary from the first few days post surgery to 20 years following filtration surgery[101]. Risk factors for the infection include thin-walled blebs with leaks, myopia, the presence of releasable sutures, concurrent respiratory infections, blebs located at the inferior limbus, unguarded filtration surgery and diabetes mellitus[101-104]. The reported incidence of bleb-related endophthalmitis is as high as 2%, even higher estimates have been reported of 6% of blebitis and 7.5% of endophthalmitis[105]. The morbidity of infections can be very high, almost one third of bacterial infections following filtering surgery that were treated with intensive medical treatment ended up with no light perception at the end of one year. Positive bacterial cultures carried a worse visual prognosis[101]. Certain organisms can spread through the conjunctiva. The lens and an intact posterior capsule with a posterior chamber intraocular lens are relative barriers to migration of bacteria but not absolute barriers.

The source of bacteria is usually ocular flora and the most common organisms are the Streptococcus species, Staphylococcus species and Haemophilus influenzae[100]. On examination, the bleb typically will have a milky white appearance with loss of clarity. It may be associated with bleb leak, hypopyon and vitreous reaction.

It can be classified as

Stage I - bleb involved,

Stage II - AC involved (Stage I+ AC reaction)

Stage III - Vitreous involved (Stage II + vitreous reaction).[100]

Stage I (blebitis) is likely to respond to intensive antibiotic treatment with more favorable outcome. When there is involvement of the AC and the vitreous cavity, a fluid tap should be taken and sent for microbiological examination. Topical and systemic antibiotics will be needed. Full-blown endophthalmitis will need aggressive treatment in the form of intravitreal injections and vitrectomy. The role of prophylactic use of topical antibiotics to prevent bleb-related infections is questionable[100]. Any conjunctivitis and blepharitis should be treated promptly. Patients should be educated about early symptoms of infections. Bleb leaks are the predisposing factors for infection, clinicians should look for the leaks during follow-up visits and treat them immediately if present. Patients

should be warned not to rub the eyes with blebs and not to swim in water likely to be contaminated.

6. MORPHOLOGICAL CLASSIFICATION OF FILTERING BLEBS

Various classification of filtration blebs based on morphologic features are available and there has been considerable variability in the features of the filtering bleb appearance included in these systems and in the manner in which morphologic features are described. Through them, favourable and unfavourable characteristics of bleb development have been discerned, and when correlated to IOP, patterns associated with bleb failure have emerged.[106]

1. The Indiana Bleb Appearance Grading Scale (IBAGS)[107]

It is an attempt to expand upon previous classifications systems based on filtering bleb morphology and thereby to establish a simple standardized method of bleb grading.

Selection of IBAGS Standard Images

Standard slit lamp images 4 for grading bleb height (H), 4 images for grading bleb extent (E), 5 images for grading bleb vascularity (V), and images using topical fluorescein application viewed through cobalt-blue filter illumination for assessing leakage with the Seidel test (S). Each of the standard images within a specific parameter (height, extent, vascularity, and Seidel test) generally represents an equal scaling interval (H0–3, E0–3, V0–4, S0–2), serving as boundaries for classification.

Standards for Height

Vertical dimension of the filtering bleb representing elevation of the conjunctival flap above the scleral surface and is divided into 4 scaling intervals:

H0, flat bleb without visible elevation;

H1, low bleb elevation;

H2, moderate bleb elevation;

H3, high bleb as compared with the standard images.

Standards for Extent

Bleb extent represents the horizontal dimension of the filtering bleb, or bleb area, and is also divided into 4 scaling intervals based on clock hours serving as boundaries for classification:

E0, no visible bleb extent to less than 1 clock hour;

E1, extent equal to or greater than 1 clock hour but less than 2 clock hours;

E2, extent equal to or greater than 2 clock hours but less than 4 clock hours;

E3, extent equal to or greater than 4 clock hours.

Standards for Vascularity

Bleb vascularity represents an assessment of the surface and deep vessel visibility upon slit lamp examination of the conjunctiva over the site of the filtration bleb and is divided into 5 scaling intervals serving as boundaries for classification:

V0, avascular/white (no microcysts visible on slit lamp examination);

V1, avascular/cystic (microcysts of the conjunctiva visible on slit lamp examination);

V2, mild vascularity;

V3, moderate vascularity; and

V4, extensive vascularity (vascular engorgement).

Standards for Seidel test

A positive Seidel test represents aqueous humour leakage through the bleb surface. Application of fluorescein with a fluorescein strip to the filtration bleb, and examination through the cobalt-blue slit lamp filter is required. The Seidel test assessment is divided into 3 scaling intervals serving as boundaries of classification:

S0, no bleb leak;

S1, pinpoint trans conjunctival leakage visible on the bleb surface (at multiple points), without streaming of fluid within 5 seconds of application.

S2, streaming aqueous egress visible within 5 seconds of application of fluorescein (diffuse or localized).

For each of the 4 parameters of height, extent, vascularity, and Seidel testing, the grading is done and is scored accordingly.

2.Kronfeld[108]proposed the first classification system of filtering blebs based on appearance and function into three categories (types I, II, and III).

Kronfeld's type I bleb is a thin-walled, polycystic bleb with trans conjunctival flow of fluid, and thus is a well-functioning bleb.

The type II bleb is described as thicker, more diffuse and perilimbally extended, relatively avascular, and with good function.

Type III bleb is a flattened bleb with little or no function, in which the scarred conjunctiva firmly adheres to the underlying sclera.[108–110]

Type IV The initial scheme lacked description of the encapsulated bleb the Tenon capsule cyst, which subsequently became an additional part of this classification system.

3.Grehn et al.[111] used a subjective scale of grading vascularization of the blebs (none, moderate, severe) in a randomized prospective comparison study of filtering blebs using a fornix-based versus limbus based conjunctival flap.

4.Lederer et al[112]compared the bleb morphology of fornix-based versus limbus-based approaches.

The filtering blebs resulted from limbus-based conjunctival flap were usually avascular, highly elevated, translucent, thin walled, and cystic.

In contrast, blebs with the fornix-based conjunctival flap were vascular, moderately elevated, with a large surface area (extending 3 or 4 clock hours at the limbus and extending far posteriorly), lacked well demarcated margins, and were not cystic.

5.Vesti[113] retrospectively examined 88 eyes after trabeculectomy in an attempt to correlate biomicroscopic appearance and function of the filtering bleb with IOP and detect possible risk factors for bleb failure.

Blebs were graded into 3 groups: diffuse filtering bleb with or without macroscopic cysts, flap sized bleb, and bleb failure. A clear association between a diffuse bleb and a good IOP response was observed.

6.Yamamoto et al.[109] used ultrasound biomicroscopic images to elucidate intra bleb structure and establish a new classification system for filtering blebs. Blebs were classified into 4 distinct groups:

type L (low-reflective) blebs showed good IOP control, with moderate-high bleb height, and identifiable microcysts;

type H (highreflective),

type F (flattened), and

type E (encapsulated) were associated with poor IOP control,

Both E and F types were generally discernable with slit lamp biomicroscopy alone. The presence of microcystic spaces by slit lamp examination corresponded to histologically clear spaces in the subepithelial connective tissue in a comparison of functioning and failed filtering blebs through light and electron microscopic examination.

Thus, the observation of microcystic spaces at the slit lamp is likely a good sign of bleb function potentially serving as channels for passage of aqueous humour.

7.Shingleton[114]noted morphologic characteristics of a successful filtering bleb and early signs of failure. A framework for categorizing failing filtration with IOP and bleb characteristics was established.

8. Picht and Grehn[115]observed the appearance of the filtering bleb and the IOP for 3 months after trabeculectomy.

The morphology of 53 developing filtering blebs were classified using the following parameters:

1) presence/absence of microcysts at 3 sectors of the filtering bleb;

2) quantity, shape, and diameter of conjunctival vessels compared with standard photographs (rated + to +++);

3) presence/absence of encapsulation if the filtering bleb; and

4) height of the filtering bleb compared with standard photographs (rated + to +++).

7. COMBINED CATARACT SURGERY AND TRABECULECTOMY

Cataract and glaucoma often co-exist in elderly patients and either one may affect the treatment and prognosis of the other condition.

Surgical Options

The following options are available for patients with coexisting cataract and glaucoma

A. When the glaucoma is controlled with one topical anti-glaucoma drug, cataract extraction alone is performed. However, on long term follow up, glaucoma medications may be needed and could be reintroduced.

B. In advanced glaucoma, trabeculectomy is done first and cataractous lens is removed by clear corneal temporal phacoemulsification at a later date, usually six months after trabeculectomy.

C. Combined Trabeculectomy with cataract extraction.

Indications for Combined surgery[116]

- Borderline controlled glaucoma despite maximal tolerable anti-glaucoma therapy.
- Adequate IOP control but unacceptable drug side effects.
- Increased number of topical medications required to control IOP (more than 2).

- Poor socio-economic status where the patient cannot afford the cost of medical management of glaucoma.
- Poor access to medical care facilities/non-compliance of patients to medical therapy.
- One eyed patients with significant cataract and moderate glaucomatous defects with the other eye having lost vision due to glaucoma.

Advantages Of Combined Surgery

- Two morbidities are handled in one sitting.
- More economical.
- IOP spike post cataract surgery is blunted.
- Rise of IOP due to long term steroid therapy in steroid responders after cataract surgery is prevented.

Different Techniques Of Combined Surgery[116]

1.Extracapsular Cataract Extraction (ECCE) Trabeculectomy

ECCE trabeculectomy is associated with excessive conjunctival and scleral manipulation leading to scarring of incision area and reducing the longevity of the filtering bleb. Larger incision also causes derangement of blood aqueous barrier leading to increased inflammation and increased incidence of wound leak.

2.Manual Small Incision Cataract Surgery And Trabeculectomy

Thomas et al on comparing manual SICS with trabeculectomy versus phacotrabeculectomy found the two techniques to be equally efficacious[117].

Krishan pal singh et aldescribed that combined trabeculectomy with cataract extraction with posterior chamber lens (PCIOL) implantation is the surgical procedure of choice for visually significant cataract interfering with the daily functions of life and failure to achieve target pressures by medications and/ or trabeculoplasty, borderline controlled intraocular pressure(IOP), disease progression on near maximal medical therapy, or advanced glaucomatous damage on at least two or three medications. Phacoemulsification with trabeculectomy had the advantage of lesser conjunctival dissection, leaving intact conjunctiva for future interventions. However, lens induced glaucoma, hard cataract, non- dilating pupil with shallow chamber and corneal opacities are some situations where manual small incision cataract surgery (MSICS) is preferred[118].

3.Phacotrabeculectomy

Phacotrabeculectomy maintains controlled anterior chamber dynamics, thereby decreasing the chances of anterior chamber reaction, hyphaema and hypotonous maculopathy. The smaller scleral and conjunctival incisions reduce the stimuli to wound healing, inflammation and post-operative bleb scarring. This results in better IOP control, reduced

complications and improved bleb longevity. Trabeculectomy and cataract surgery can be performed from the same side superiorly or may be performed separately. Lochhead J et al stated that two site phacotrabeculectomy entails less conjunctival manipulation and leads to better control of intraocular pressure[119].

8. REVIEW OF LITERATURE

Venkatesh et al[120] described that many patients in the outreach screening camps presented with advanced cataract and glaucoma, for whom a trabeculectomy combined with manual small incision cataract surgery provides a safe and cost effective technique with least complications.

Manju et al[121] suggested that Glaucoma surgery is indicated in patients who fail to respond to maximally tolerated medical therapy or who continue to have progressive optic nerve damage in spite of medical control. Glaucoma surgery alone can significantly increase the risk of development of cataract. Cataract surgery following trabeculectomy can result in bleb failure especially within the first 6 months. So in patients with visually significant cataract and glaucoma requiring surgical correction, a combined technique of surgery is considered as a standard surgical method of management.

Spaeth GL[122]suggested three major indications exist for combined cataract extraction and glaucoma surgery: 1) a visually significant cataract that warrants removal in a patient with uncontrolled glaucoma; 2) a visually significant cataract that warrants removal in a patient with a severe glaucomatous optic nerve damage that is expected to progress if postoperative pressure increases; and 3) a cataract that has a marginal

effect on visual acuity but is expected to progress and become visually significant after glaucoma surgery.

Bobrow JC et al[123] combined Trabeculectomy with extracapsular cataract extraction (ECCE) with a 11-mm wound. He followed 35 patients for at least 80 months. He found that eyes with trabeculectomy combined with cataract surgery versus those that underwent cataract surgery alone had an IOP reduction of 8.2 ± 4.6 mmHg versus 4.4 ± 3.3 mmHg. Medications were reduced by 1.76 ± 0.82 versus 1.28 ± 0.86, respectively.

Budez DL et al[124]evaluated the potential benefits, complications, and prognostic risk factors for failure of phacotrabeculectomy performed with 5-fluorouracil (5-FU) and mitomycin-C (MMC) and without antifibrotic agents. The retrospective study showed that All 3 groups had statistically significant lower intraocular pressures (IOP) on fewer antiglaucoma medications at 6-month, 12-month, and last follow-up compared to preoperative levels ($P < .05$). The study concluded phacotrabeculectomy to be effective regardless of antimetabolite use.

Ellinghaus G et al[125] study concluded that the mean decrease in intraocular pressure between 21 patients who have undergone phaco trabeculectomy were equivalent with 13 eyes who underwent trabeculectomy with Extracapsular cataract extraction.

David et al[126] study concluded that 57% of eyes achieved lOP control (< 21 mmHg) on no medications, 30% were controlled on fewer medications (relative to preoperative medications), and 5% were controlled on the same medications. Thus, 87% of patients had a postoperative lOP lower than 22 mmHg on fewer or no medications 16.8 months (mean) after combined ECCE, PCIOL implantation, and trabeculectomy.

Khurana et al[127] study concluded that combined small incision cataract surgery (SICS) with trabeculectomy appears to be a safe and effective approach to the management of co-existing senile cataract and primary open-angle glaucoma. A good filtering bleb was observed in 93.33 % of cases.

Johnson et al[128] described the complications specific to the combined procedure be divided into minor and major categories. Minor complications include transient bleb leak through the edge of the conjunctival flap, hyphaema, and against-the-rule astigmatism. Major complications include hypotony with a flat anterior chamber and IOL-corneal touch, and elevation of IOP due to tight trabeculectomy flap sutures or retained viscoelastic material.

Usha et al[129] reported that 60% of the patients in the study group had advanced glaucomatous damage, and compared the postoperative complication between conventional trabeculectomy with and without

cataract surgery. Shallow AC and overdrainage was seen in 8% and 12% respectively. Fibrinous reaction in AC was 14% and 0%. Hyphaema was reported in 16% and 8%. Choroidal detachment was seen in 4% and 2% respectively. Cataract was reported to be 12% in trabeculectomy group. IOL capture was reported to be 6% in combined group.

Vinita et al[130] suggested Combined phacotrabeculectomy at one site is faster and easier to perform than two-site combined surgery. Less number of follow-up visits is needed. This surgical procedure can be a good alternative procedure in comparison to two sequential surgeries in patients with cataract and glaucoma.

RongSS et al[131] concluded that IOP at 18 months following primary trabeculectomy in PACG patients is associated with postoperative IOPs at 1 month. Control of early IOP to 13.5 or less may provide better outcomes.

Okimotos et al[132] studied the early postoperative IOP that can predict the pressure control in trabeculectomy and concluded that IOP of 8mmHg was associated with successful outcome in patient undergoing trabeculectomy and young age was found to be a risk factor for surgical failure.

Lochhead et al[133] concluded that in both trabeculectomy and phaco trabeculectomy procedures the magnitude of postoperative IOP reduction was proportional to the preoperative IOP.

Hamed esfandiari et al[134] studied the predictive value of postoperative bleb morphological features and intraocular pressure (IOP) on the success rate of trabeculectomy. An IOP increase more than 3 mmHg during the first 30 days after surgery was a good predictor of failure.

Shibal bhartiya et al[135] suggested that failed blebs are flat and vascular. Such blebs can be best managed by needling with a 26G needle. Success is indicated by reduction in IOP and egress of aqueous with formation of the bleb.

Sandra furrer et al[136] suggested that excessive vascularisation of bleb had a fair agreement to higher postoperative IOP and found no agreement between the presence of corkscrew vessels and IOP, nor between presence of bleb encapsulation and IOP.

Picht et al[137] concluded that development of filtering bleb after trabeculectomy is essential for long term success of filtering surgery. Follow-up with morphological classification of developing filtering blebs may help to recognise warning signs of bleb failure.

Franz Marie et al[138]determined the success and failure rates of primary trabeculectomy and identified the factors predictive of failure. At one-year follow-up, the success rate was 79.8%. Early postoperative IOP at 1 month was predictive of the outcome of primary trabeculectomy at 1 year.

Harsha et al[139] compared the surgical outcomes of single site phacotrabeculectomy without mitomycin C (MMC) in primary angle closure glaucoma (PACG) and primary open-angle glaucoma (POAG). The probability of complete success at 12 months was 81.7±4.6% in the PACG group and 75.0±5.1% in the POAG group. The probability of qualified success at 12 months was 95.5±2.5% in the PACG group and 100.0% in the POAG.

9. AIM OF THE STUDY

AIM

To study the long term control of intraocular pressure and bleb morphology in patients undergoing combined Small incision cataract surgery and trabeculectomy.

MATERIAL AND METHODS

Study Design: Prospective interventional cohort study

Sample Size: 83 eyes of 75 patients.

Source Of Data: A cohort of Patients with moderate or severe glaucomatous damage along with cataract attending the ophthalmology outpatient department in Tirunelveli medical college for a period of 6 months from March 2017 to August 2017.

Inclusion criteria

- All adult glaucomas like POAG, PACG and secondary glaucomas.

- All patients above 30 years of age.

-Both male and female.

Exclusion criteria

- Patients with neovascular glaucoma.

-patients with mild glaucomatous damage who can be managed medically.

- Past history of cataract surgery.

-Patients with severely scarred conjunctiva (eg. Chemical burns, Steven-Johnson syndrome).

- Patients with previous history of trabeculectomy.

METHODOLOGY

83 eyes of 75 patients with combined glaucoma and cataract were enrolled in the study after getting informed written consent.

A detailed history regarding Age, Associated systemic illness like Diabetes mellitus, systemic Hypertension, COPD, cardiac diseases, duration of glaucoma was elicited.

Treatment history like use of antiglaucoma medication, Regularity of medication, previous laser procedures in eye, previous cataract surgery was elicited.

History of glaucoma in family members was elicited.

Detailed glaucoma evaluation done including

1. Distant visual acuity using Snellen's chart.

2. Intraocular pressure assessment using Goldmann applanation tonometer.

3. Anterior segment examination using slit lamp biomicroscopy and optic disc examination using 90D lens.

4. Gonioscopy using Zeiss 4 mirror gonioscope

5. Visual field examination using Humphrey perimeter (Glaufield lite).

Patients were categorised into mild, moderate, severe glaucomatous damage based on optic disc changes and visual field defect based on mean defect. A value of 0-6 signifies mild, upto 12 a moderate defect and more than 12 a severe defect.[140]

Target intraocular pressure was determined based on severity of glaucomatous damage, in mild glaucomatous damage initial target IOP was kept 15-17mmHg, for moderate glaucoma 12-15mmHg and in low teens for severe damage[141].For Preoperative intraocular pressure of 20 mmHg and below, the target IOP was set as 30% below the baseline value.

Hyperosmotic agents like intravenous 20% Mannitol 1g/Kg bodyweight at 3-5 ml/min was used when Intraocular pressure was very high.

Preoperative evaluation was done including Complete blood count, Blood sugar, Blood pressure, Nasolacrimal duct syringing.

After complete evaluation and diagnosis patients were posted for a combined small incision cataract surgery with trabeculectomy.

Surgical technique

Peribulbar anaesthesia containing a mixture of (2% lignocaine, 0.5% bupivacaine with hyaluronidase 5IU/ml and adrenaline one in one lakh) was given.

Eyelids and lashes were prepared. Skin over the periocular area was cleaned with 5% povidone iodine for 3 minutes. A fornix based conjunctival flap was dissected superiorly, undermined to 5 mm and tenon's capsule separated. A partial thickness scleral flap was made 2mm away from the limbus with a cresent blade, dissection was performed 1-2mm into the clear cornea. A corneal paracentesis was made temporally, through which capsulorhexis was performed after injecting viscoelastic substance. The anterior chamber is entered with a 3.2mm keratome at 12'o clock position. The inner lip of tunnel enlarged to around 8mm. After hydrodissection and delineation the nucleus was rotated and prolapsed into the anterior chamber using Sinsky hook. Nucleus was rotated and delivered out by sandwich technique. Remaining cortex aspirated with a simcoe 2-way-irrigation aspiration cannula. A single piece posterior chamber rigid PCIOL is placed in the capsular bag. Viscoelastic was aspirated out. Trabeculectomy was performed by excising 0.5mm/0.5mm tissue from posterior lip of sclera tunnel using 11 blade followed by iridectomy. Two sutures were taken on either side of the punched area to close the sclera

tunnel and sutures were buried. Additional interrupted sutures were taken at corners of scleral tunnel. Conjunctiva was sutured in water tight manner using 10-0 nylon under tension. The patency of trabeculectomy was tested at the end of surgery by injecting ringer lactate through side port and observing for formation of diffuse bleb without any leak. Additional sutures were placed if any leak was found. Intracameral moxifloxacin 0.1 ml instilled and side port was stromal hydrated. A subconjunctival injection of corticosteroids(Dexamethasone) and antibiotics(Gentamycin) was given in inferior fornix. Post operatively patient was treated with moxifloxacin and dexamethasone 8 times/day for 1 week, prednisolone acetate 1% drops six times per day and gradually tapered over 2-3 months as necessary. Cycloplegic 1% Atropine eye drops 3times/day was given on first 5 days and then subsequently stopped. Tablet Acetazolamide 250 mg BD was given as required for first 5 postoperative days.

After surgery patients were followed up on postoperative day 1, day 5, day10,1 month,3 months, 6months, 12 months. At each postoperative visit visual acuity, intraocular pressure, Morphology of bleb, Patency of peripheral iridectomy, Anterior chamber depth, Cup: Disc ratio and any postoperative complications were recorded. Visual field was tested at 6months and 1 year using Humphrey's perimeter. Age distribution, sex, and laterality of the operated eye in the study population was tabulated.

Patients were categorised into primary open angle glaucoma, Primary Angle closure glaucoma and Secondary open angle and secondary angle closure glaucomas. Patients on irregular AGM were grouped with patients who had no antiglaucoma medication for data analysis. Poor control of intraocular pressure is considered when the achieved final IOP at the end of 1 year is 3mmHg above the target IOP. Complete success was defined as IOP<21mmHg without any antiglaucoma medications. Qualified success was defined as IOP<21mmHg with antiglaucoma medication[139]. Bleb Morphology during the follow up period were categorised into type 1 polycystic bleb, type 2 diffuse bleb, type 3 flat bleb, type 4 encysted bleb.[108] Out of 83 eyes in the study 2 were lost in follow up, hence post operative results were tabulated for 81 eyes using odds ratio, correlation coefficient and relative risk.

10. RESULTS

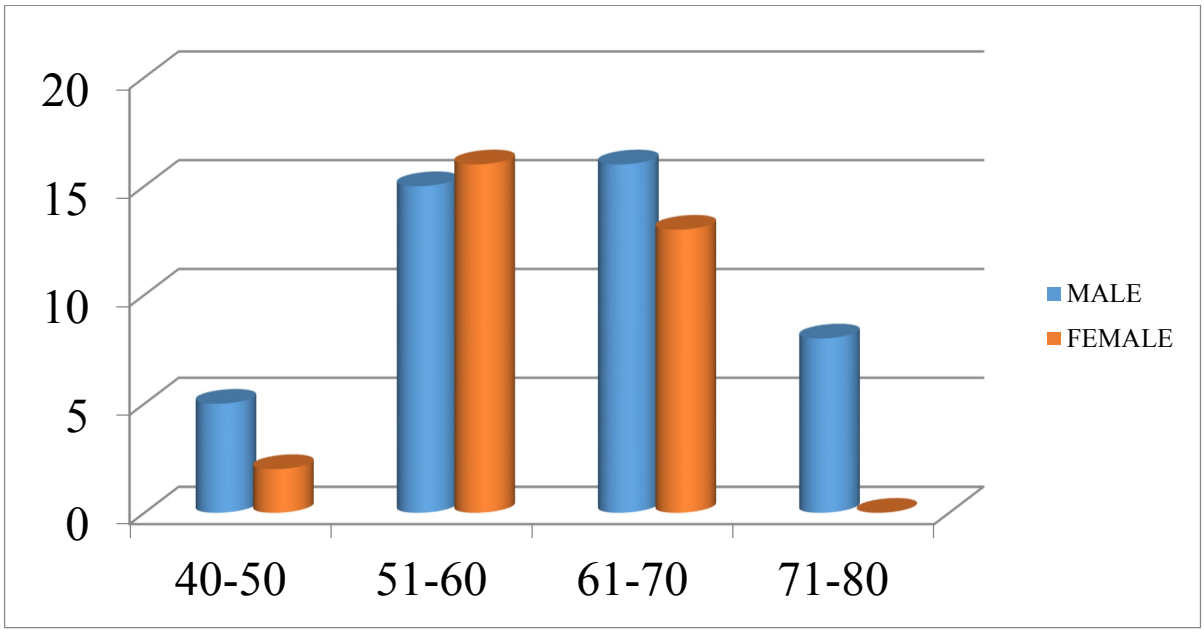


Figure 1: Age wise sex distribution

Figure 1 represents age wise sex distribution of study population. In the 40-50 years age group 5 were male and 2 female. In the 51-60 years age group 15 were male and 16 female. In the 61-70 years age group 16 were male and 13 female. In the 71-80 years age group all 8 patients were male.

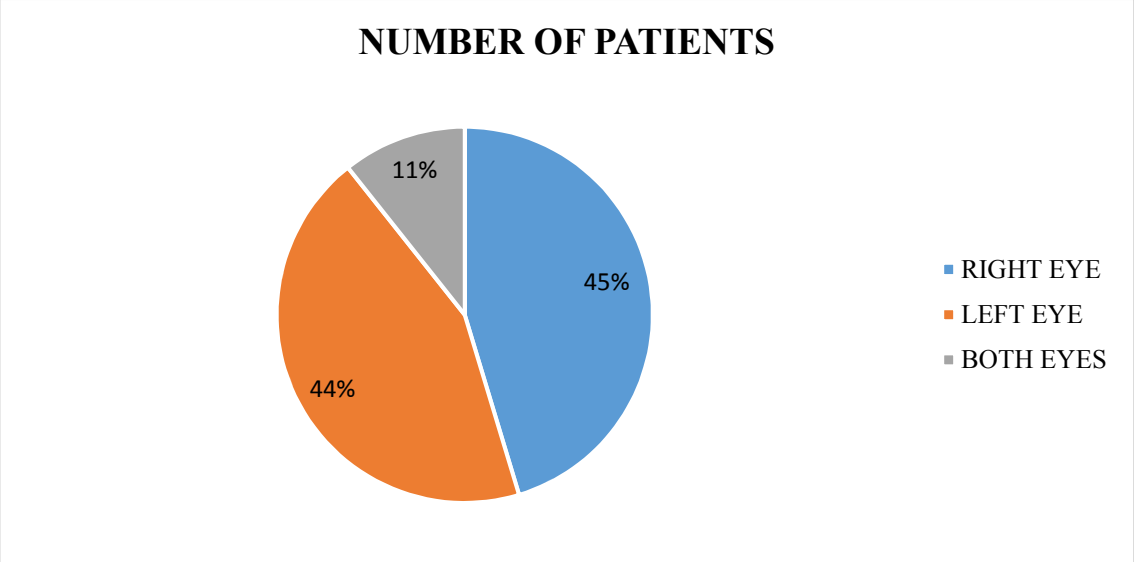


Figure 2: Laterality of operated eye

Figure 2 represents that out of 75 patients, 34 were operated in the right eye, 33 patients were operated in left eye. 8 patients were operated in both eyes.

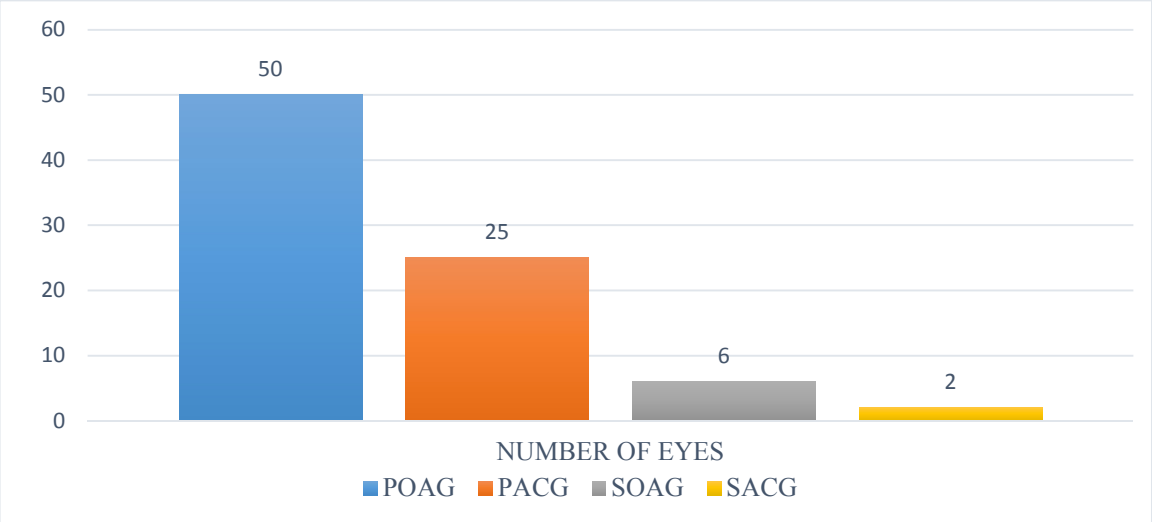


Figure 3: Distribution of types of glaucoma

Figure 3 shows that out of 83 eyes of 75 patients 50 eyes had POAG, out of which 1 was lost in follow up.25 had PACG, 1 was lost in follow up.6 patients had SOAG,2 had SACG.

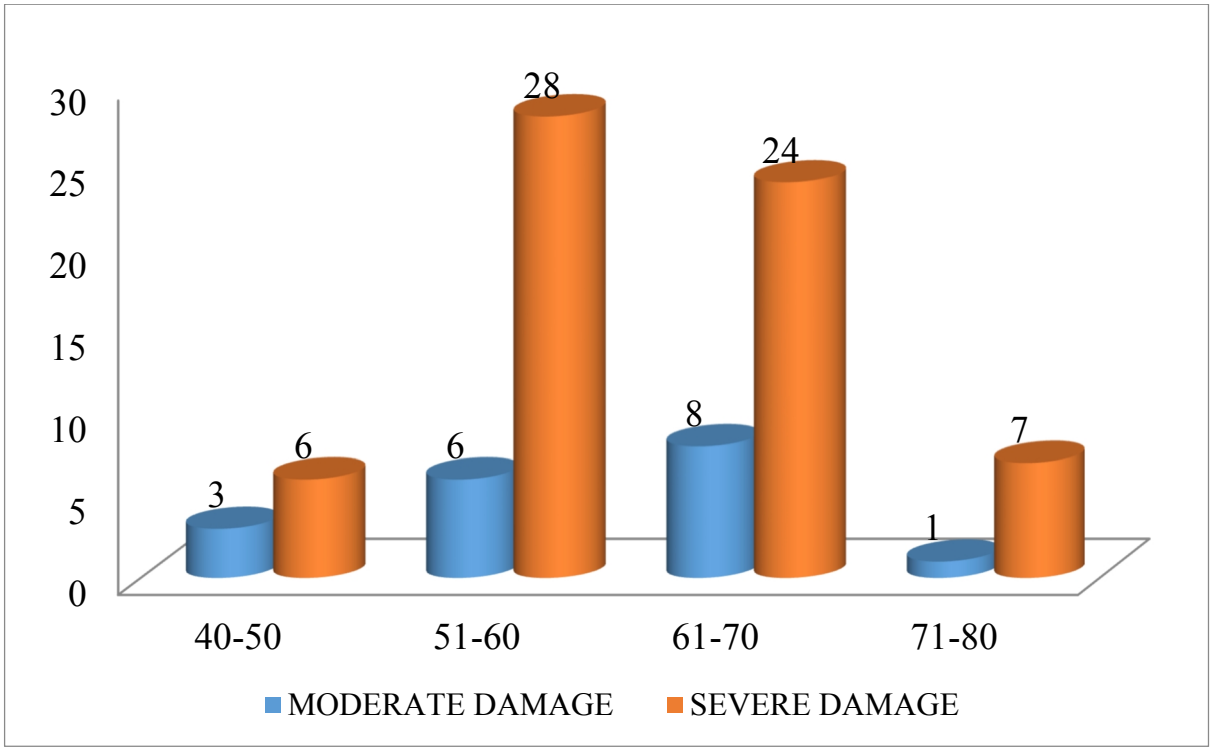


Figure 4: Age wise distribution of severity of glaucoma

Out of 83 eyes of 75 patients 65 eyes had severe glaucomatous damage and 18 eyes had moderate glaucomatous damage. In the 40 to 50 years age group 6 eyes had severe glaucomatous damage and 3 had moderate damage. In the 51-60 years age group 6 eyes had moderate glaucomatous damage and 28 eyes had severe damage. In the 61-70 years age group 8 eyes had moderate glaucomatous damage 24 eyes had severe glaucomatous damage. In the 71-80 years age group 1 eye had moderate glaucomatous damage, 7 had severe glaucomatous damage.

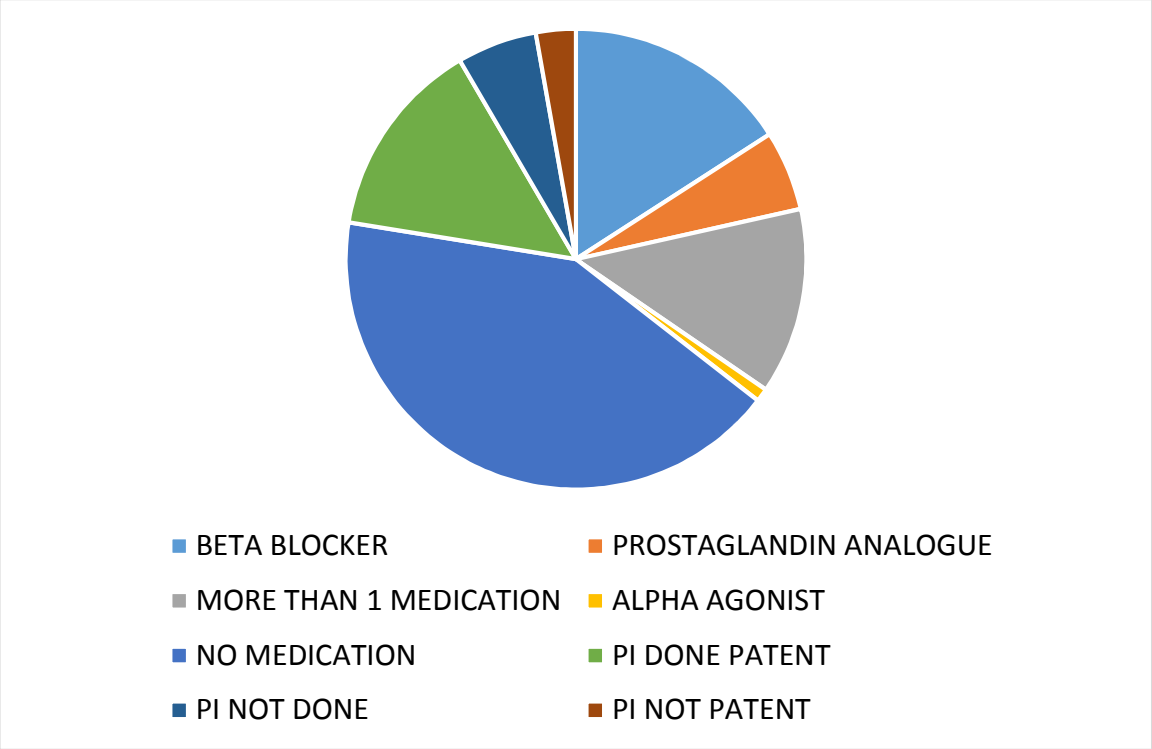


Figure 5: Preoperative treatment modalities in 83 eyes

Figure 5 describes that out of 25 eyes(out of 25 eyes one was lost in follow up) with angle closure glaucoma, PI done in 19 eyes out of which 16 was patent. In 6 eyes with angle closure glaucoma PI was not done previously. Regarding antiglaucoma medication, Among 83 eyes, 17 eyes used beta blocker, 6 eyes used travoprost, 1 eye used alpha agonist, 14 eyes used more than 1 antiglaucoma medication, 45 eyes were on no medication.

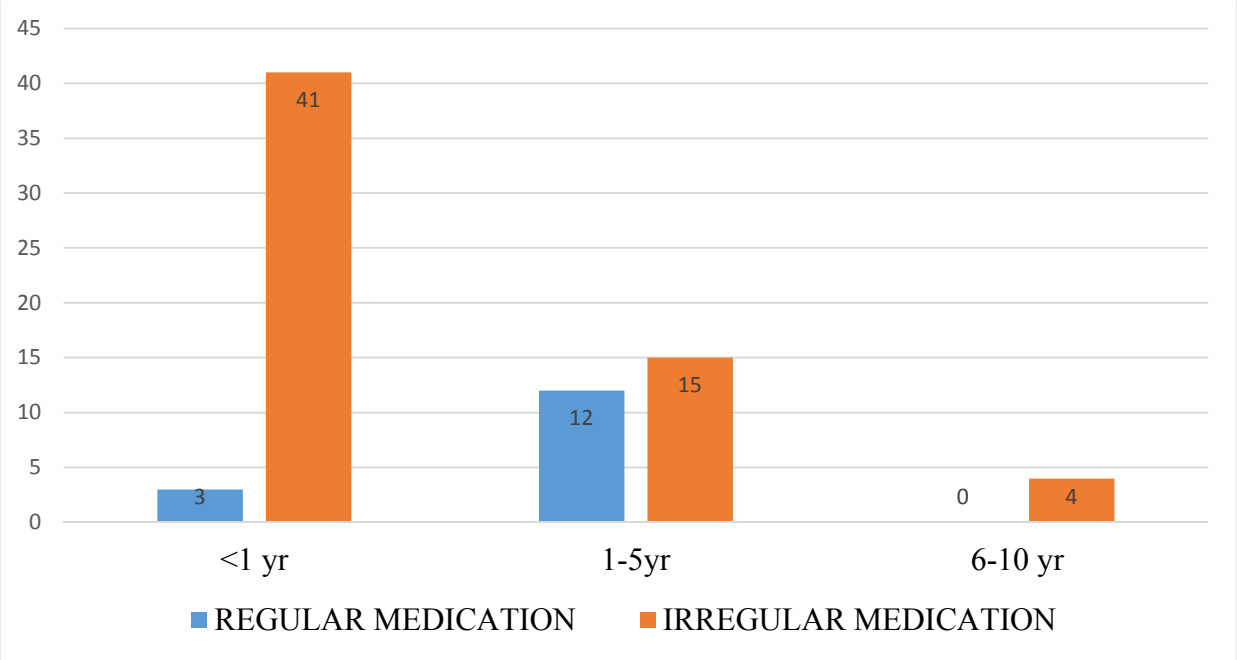


Figure 6: Duration of glaucoma and regularity of AGM

Figure 6 describes that in patients with duration of glaucoma less than 1 year, 41 patients had irregular AGM. 3 patients had regular AGM. Among patients with duration of glaucoma 1-5 years, 12 patients had regular AGM,15 patients had irregular AGM. Patients with duration of glaucoma 6-10 years all were on irregular medication.

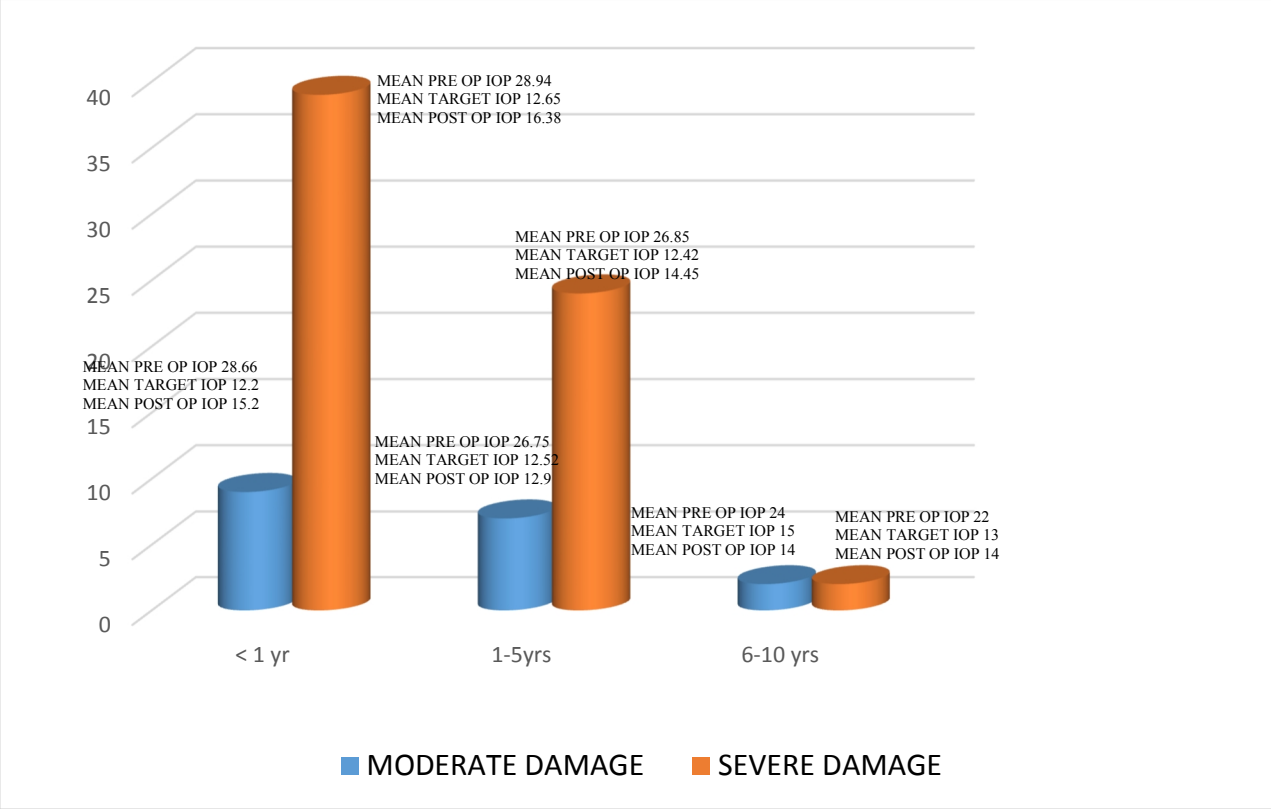


Figure 7 Duration of glaucoma and severity of damage with mean IOP

Figure 7 demonstrates that out of 48 eyes with duration of glaucoma less than 1 year 39 eyes had severe glaucomatous damage, 9 eyes had moderate glaucomatous damage. Out of 31 eyes with duration of glaucoma1-5 years, 24 eyes had severe glaucomatous damage and 7 had moderate glaucomatous damage. Out of 4 eyes with duration of glaucoma 6-10 years, 2 eyes had severe glaucomatous damage, 2 eyes had moderate glaucomatous damage.

Pre operative IOP	No of eyes
11-20 mmHg	33
21-30 mmHg	19
31-40 mmHg	13
41-50 mmHg	12
>50 mmHg	6

Table 2: preoperative intraocular pressure distribution in 83 eyes

Out of 83 eyes 33 eyes had intraocular pressure in the range of 11-20 mmHg. 19 eyes had IOP in the range of 21-30 mmHg.13 eyes had IOP in the range of 31-40mmHg. 12 eyes had IOP in the range of 41-50 mmHg. 6 eyes had IOP above 50 mmHg.

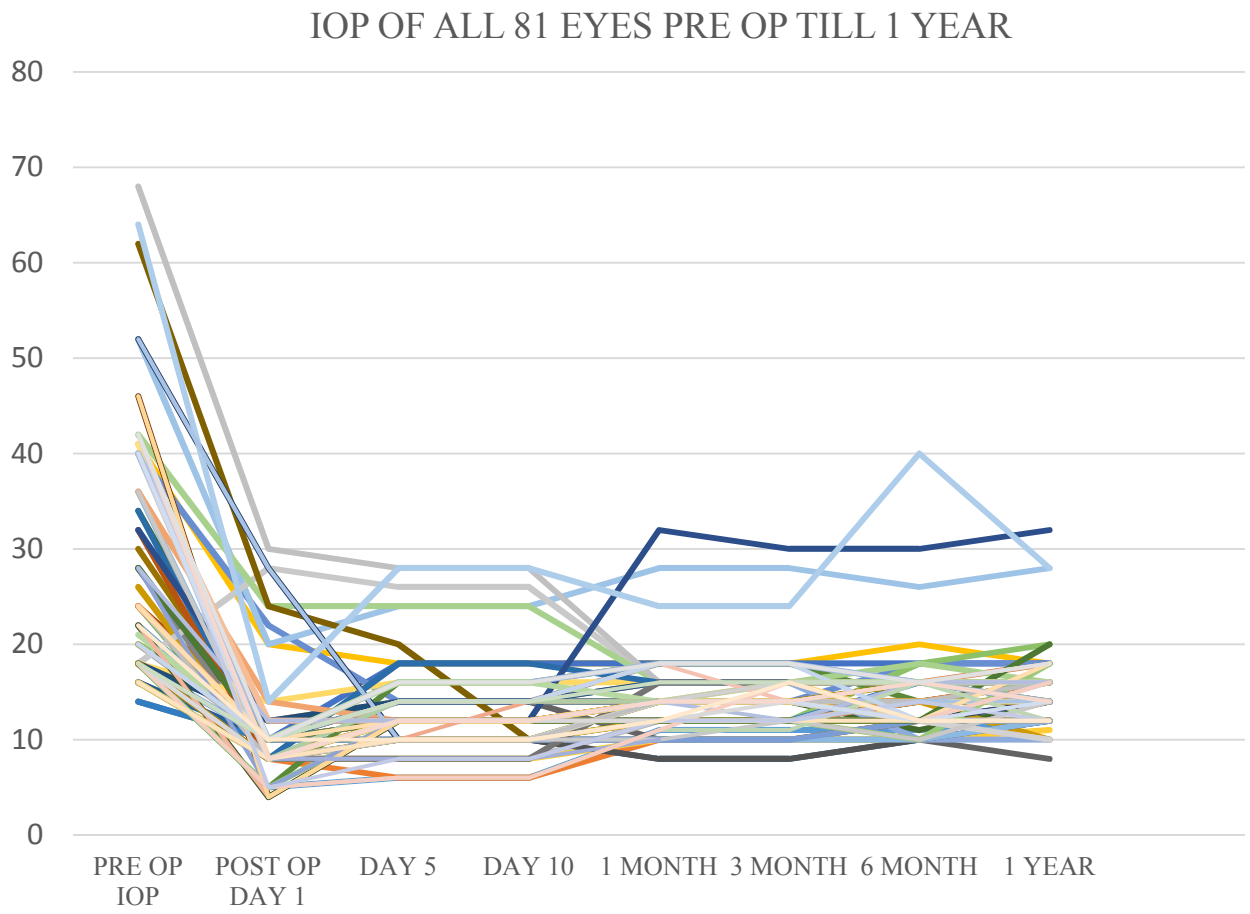


Figure 8: Preoperative and postoperative IOP of all 81 eyes over a period of 1 year.

Figure 8 shows the intraocular pressure graph line of all 81 eyes till 1 year follow up. The mean pre op IOP of 81 eyes was 28.1mmHg, mean target IOP was 12.7mmHg, Mean post op IOP was 15mmHg.

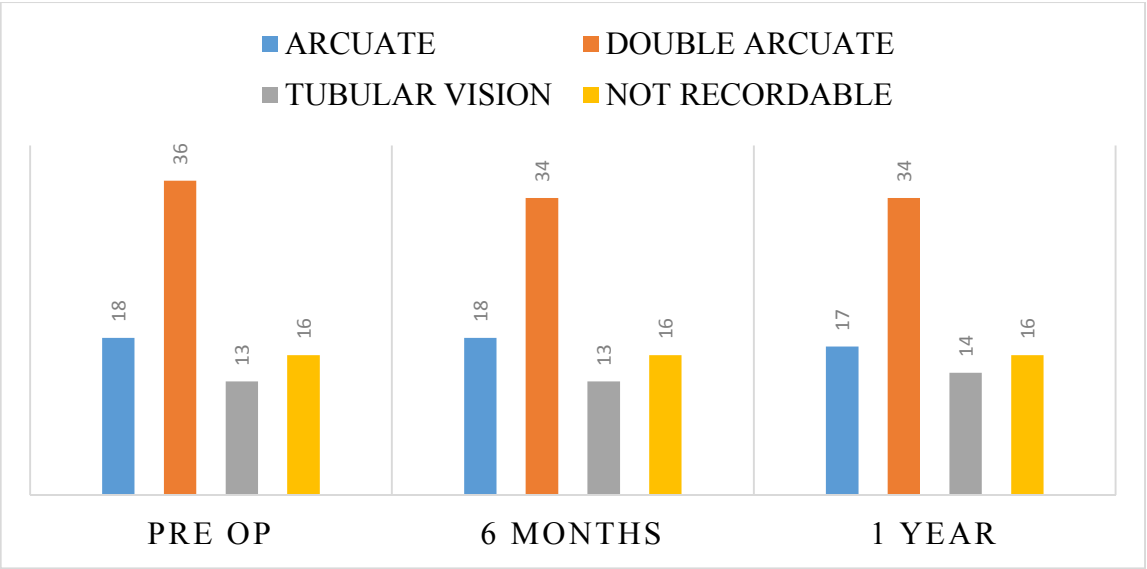


Fig 9: Progression of visual field defects until 1 year of follow up

Figure 9 demonstrates that preoperatively out of 83 eyes 18 eyes had arcuate field defect, 36 had double arcuate defect,13 had tubular vision. In 16 eyes the field could not be assessed because of poor visual acuity due to significant cataract or glaucomatous damage. Out of 83 eyes two were lost in follow up. Out of 81 eyes no field progression was noted in 6 months. At 1 year of follow up, one eye progressed from double arcuate to tubular vision, 1 eye progressed from arcuate to double arcuate scotoma.

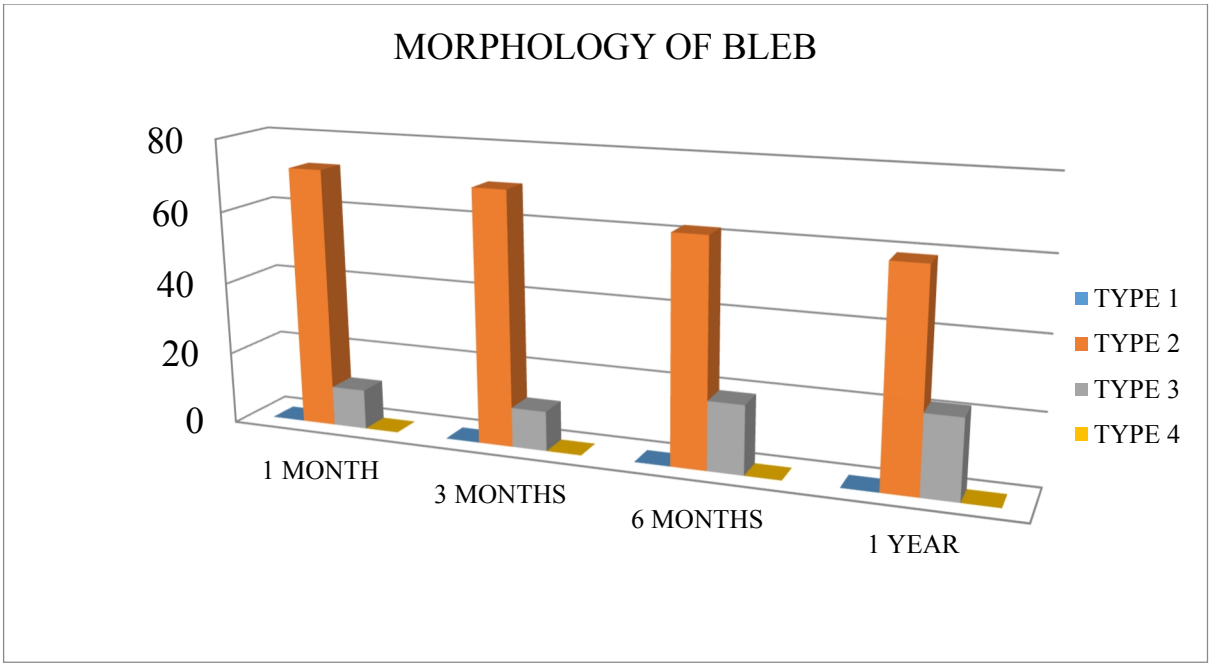


Fig 10 Bleb morphology over a 1 year period of follow up

Out of 81 eyes 70 eyes had type 2 diffuse bleb, 11 eyes had type 3 flat bleb at 1 month of follow up. At 3 months of follow up bleb morphology was same. At 6 months of follow up 19 eyes had flat type 3 bleb, out of which 10 were vascularised and 62 eyes had diffuse type 2 bleb out of which 2 were vascularised. At 1 year of follow up 59 eyes had type 2 bleb out of which 2 were vascularised and 22 eyes had type 3 flat bleb, out of which 10 were vascularised.

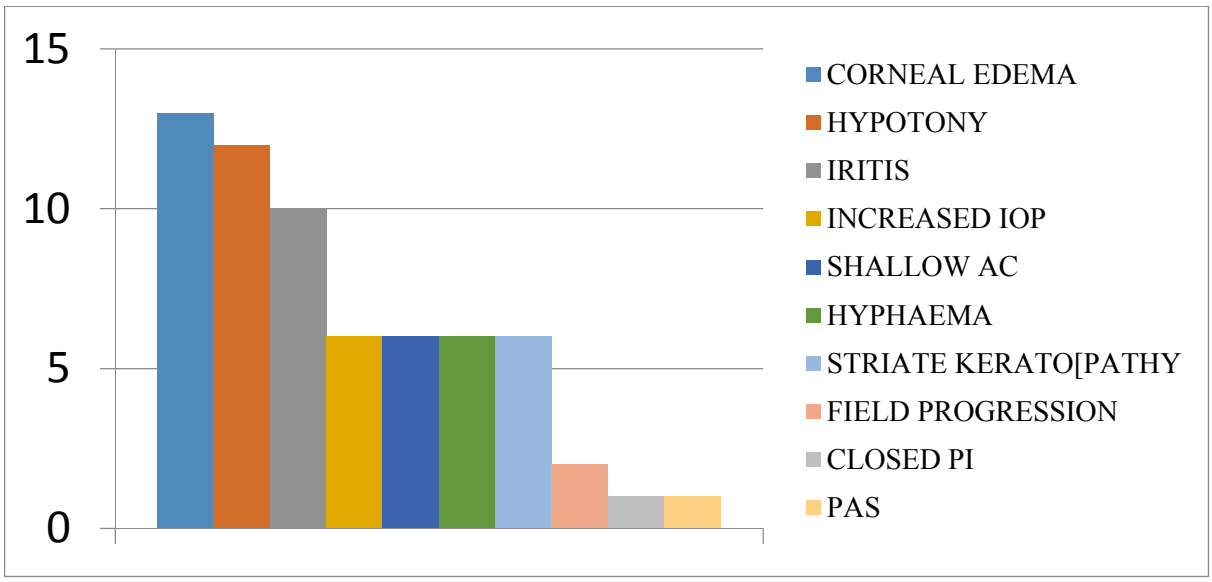


Figure 11: List of postoperative complications

Out of 81 eyes 13 eyes had corneal edema, 12 had hypotony, 10 had iritis, 6 eyes had transient increase in IOP, 6 had shallow anterior chamber, 6 had hyphaema, 6 had striate keratopathy, 2 had field progression, 1 had peripheral anterior synechiae, in 1 eye PI ostium was closed.

Corneal edema lasted for a mean duration of 2.5 days and was associated with rise in Intraocular pressure or inflammation or hyphaema, some of these were overlapping. Majority had epithelial edema with bullae. The causative factor was identified and treated.

Ocular hypotony lasted for a mean duration of 2.6 days. It was transient in nature, majority of the cases resolved spontaneously, cases associated with shallow AC was treated with Pressure bandage.

10 patients who had iritis the mean duration was 3.6 days and was treated with intensive topical steroids and mydriatics.

6 patients had a transient rise in intraocular pressure in the immediate post operative period. The mean duration was 3.6 days and was effectively treated with T. Acetazolamide 250 mg bd, 20% injection mannitol 1g/kg body weight was given as and when needed, associated inflammation was treated with topical steroids and mydriatics.

Hyphaema lasted for a mean duration of 2.8 days. It could have resulted from bleeding from scleral tunnel or from injury to iris intraoperatively. All cases resolved spontaneously. In all these cases IOP was monitored, topical anti glaucoma medications were used when rise in IOP was noted, associated inflammation was treated with topical steroids and mydriatics.

Shallow anterior chamber lasted for a mean duration of 2.3 days. 5 out of 6 case was associated with a low intraocular pressure in the first postoperative day. The patients were treated with a pressure bandage for 24 hours.

Striate keratopathy which is characterised by folds in Descemet's membrane and corneal edema lasted for a mean duration of 2.8 days. It was treated effectively with 5% hypertonic sodium chloride 5times per day.

Out of 83 eyes2 eyes were lost in follow up. Hence statistical analysis was made for 81 eyes.

Assessment of Risk factors for flat bleb

	Flat bleb	Diffuse bleb
POAG present	14	35
POAG absent	8	24

Table 3: POAG as risk factor for flat bleb

Table 3 shows that in 22 eyes with flat bleb 14 eyes had POAG. In 59 eyes with diffuse bleb 35 had POAG. The odds ratio was 1.2, P value 0.72.

	Flat bleb	Diffuse bleb
PACG present	6	18
PACG absent	16	41

Table 4: PACG as a risk factor for flat bleb

Table 4 describes that in 22 eyes with flat bleb 6 had Primary Angle closure glaucoma, In 59 eyes with diffuse bleb 18 had PACG. The odds ratio was 0.8. P value 0.7.

	Flat bleb	Diffuse bleb
< 50 years	1	5
≥ 50 years	21	54

Table 5: Age 50 and below as risk factor for flat bleb

Table 5 shows that out of 22 patient with flat bleb 1 patient was below 50 years of age, In 59 eyes with diffuse bleb 5 were below 50 years of age. The odds ratio was 0.5. P value 0.5.

	Flat bleb	Diffuse bleb
Regular AGM	13	24
Irregular/Not used AGM	9	35

Table 6: Regular usage of Antiglaucoma drugs as a risk factor for bleb failure

Table 6 shows that in 22 eyes with flat bleb 13 were on regular AGM, In 59 eyes with diffuse bleb 24 were on Regular AGM. Odds ratio was 2.1. P Value 0.1.

	Flat bleb	Diffuse bleb
Severe damage	15	48
Moderate damage	7	11

Table 7: severe glaucomatous damage as a risk factor for flat bleb

Table 7 describes that at the end of 1 year, out of 22 eyes with flat bleb 15 had severe glaucomatous damage. In 59 eyes with diffuse bleb 48 had severe damage. Odds ratio was 0.4.P Value 0.2.

	Flat bleb	Diffuse bleb
Vascularisation present	10	2
Vascularisation absent	9	60

Table 8: Vascularisation as a risk factor at 6 months follow up

Table 8 describes that at 6 months of follow up 10 out of the 19 flat blebs were vascularised and 2 out of the 62 diffuse blebs were vascularised. Odds ratio was 33. **P value 0.0001.**

	Flat bleb	Diffuse bleb
Vascularisation present	10	2
Vascularisation absent	12	57

Table 9: Vascularisation as a risk factor at 1 year of follow up

Table 9 describes that at 1 year of follow up, 10 out of the 22 flat blebs were vascularised and 2 out of the 59 diffuse blebs were vascularised. Odds ratio was 23.75. **P value 0.0001.**

Assessment of Risk factors for poor control of postoperative intraocular pressure.

	Poor control of postoperative IOP	Good control of postoperative IOP
POAG present	15	34
POAG absent	8	24

Table 10: POAG as risk factor for poor postoperative control of IOP

Table 10 describes that out of 23 patients with poor intraocular pressure at 1 year 15 had POAG. Out of 58 patients with good postoperative intraocular pressure at 1 year 34 had POAG. Odds ratio was1.3. P value 0.58.

	Poor control of postoperative IOP	Good control of postoperative IOP
PACG present	5	19
PACG absent	18	39

Table 11: PACG as risk factor for poor postoperative control of IOP

Table 11 describes that out of 23 patients with poor intraocular pressure at 1 year 5 had PACG. Out of 58 patients with good postoperative intraocular pressure at 1 year 19 had PACG. Odds ratio was0.57. P value 0.33.

	Poor control of postoperative IOP	Good control of postoperative IOP
< 50 years	2	5
≥ 50 years	21	53

Table 12: Young age as a risk factor for poor control of intraocular pressure

Table 12 shows that out of 23 eyes with poor postoperative intraocular pressure 2 eyes were below 50 years of age, in 58 eyes with good post op IOP control 5 were below 50 years of age. The odds ratio was 1.009. P value 0.99.

	Poor control of postoperative IOP	Good control of postoperative IOP
Pre op IOP ≥ 30 mmHg	6	22
Pre op IOP < 30 mmHg	17	36

Table 13: High preoperative IOP as a risk factor for poor control of intraocular pressure.

Table 13 describes out of 23 patients with poor intraocular pressure at 1 year 6 had IOP 30 and above. Out of 58 patients with good postoperative intraocular pressure at 1 year 22 had IOP 30 and above. Odds ratio was 0.57. P value 0.31.

	Poor control of postoperative IOP	Good control of postoperative IOP
Beta Blocker used	3	14
Beta Blocker not used	20	44

Table 14: Beta blocker as a risk factor for poor control of intraocular pressure

Table 14 shows that out of 23 eyes with poor control of postoperative intraocular pressure 3 used Beta Blocker regularly. Out of 58 eyes with good postoperative IOP control, 14 eyes used Beta Blocker. Odds ratio was 0.47.P value 0.2.

	Poor control of postoperative IOP	Good control of postoperative IOP
Severe damage	18	45
Moderate damage	5	13

Table 15: severe glaucomatous damage as a risk factor for poor control of post operative IOP.

Table 15 describes that, At the end of 1 year out of 23 eyes with poor control of post op IOP 18 had severe glaucomatous damage. Out of 58 eyes with good post op IOP control 45 had severe damage. Odds ratio was 1.04. P Value 0.9.

	Poor control of postoperative IOP	Good control of postoperative IOP
Flat bleb	9	12
Diffuse bleb	14	46

Table 16: Flat bleb as a risk factor for poor control of postoperative IOP

Table 16 describes that, At the end of 1 year out of 23 eyes with poor 0postoperative IOP control 9 had flat bleb. Out of 58 eyes with good postoperative IOP control 12 had flat bleb. Odds ratio was 2.4. P Value 0.09.

	Poor control of postoperative IOP	Good control of postoperative IOP
Postop IOP > 10mmHg On day 5	10	8
Post op IOP ≤ 10 mmHg on day 5	13	50

Table 17: Intraocular pressure of more than 10mmHg on postoperative day 5 as a risk factor for poor control of postoperative IOP.

Table 17 describes that out of 23 eyes with poor intraocular pressure at 1 year, 10 eyes had IOP above 10mmHg on day 5. In 58 eyes with good

postoperative intraocular pressure 8 eyes had IOP above 10mmHg on day 5. Odds ratio was 4.8. **P value 0.003.**

	Poor control of postoperative IOP	Good control of postoperative IOP
Postop IOP ≥ 13mmHg on day 10	15	13
Postop IOP < 13 mmHg on day 10	8	45

Table 18: Intraocular pressure of 13mmHg or more on 10th postoperative day as a risk factor for poor control of postoperative IOP.

Table 18 describes that out of 23 eyes with poor intraocular pressure at 1 year, 15 eyes had IOP 13mmHg and above on day 10. Out of 58 eyes with good postoperative intraocular pressure 13 eyes had IOP 13mmHg and above on day 10. Odds ratio was 6.5. **P Value 0.0005.**

	Poor control of postoperative IOP	Good control of postoperative IOP
Difference > 4mmHg	15	23
Difference ≤ 4mmHg	8	35

Table 19: Postop rise in IOP more than 4mmHg within 1 month as a risk factor for Poor postoperative IOP control.

Table 19 describes that out of 23 eyes with poor postoperative IOP, 15 eyes had a difference of more than 4mmHg between postoperative day 1 and 30. Out of 58 eyes with good postoperative IOP, 23 eyes had a difference of more than 4mmHg between postoperative day 1 and 30. Odds ratio 2.8. **P value 0.04.**

	Poor control of postoperative IOP	Good control of postoperative IOP
Vascularisation present	8	4
Vascularisation absent	15	54

Table 20: Vascularisation as a risk factor for poor post op IOP at 6 months of follow up.

Table 20 describes that out of 23 eyes which had poor postoperative IOP control at 6 months of follow up, vascularisation was present in 8 eyes. Out of 23 eyes with good postoperative IOP control vascularisation was present in 4 eyes. Odds ratio was 7.2. **P value 0.001.**

	Poor control of postoperative IOP	Good control of postoperative IOP
Vascularisation present	7	5
Vascularisation absent	16	53

Table 21: Vascularisation as a risk factor for poor postoperative IOP at 1 year of follow up.

Table 21 describes that at 1 year of follow up, vascularisation was present in 7 eyes which had poor post op IOP control at 1 year and vascularisation was present in 5 eyes with good control of post op IOP. Odds ratio was 4.6. **P value 0.01.**

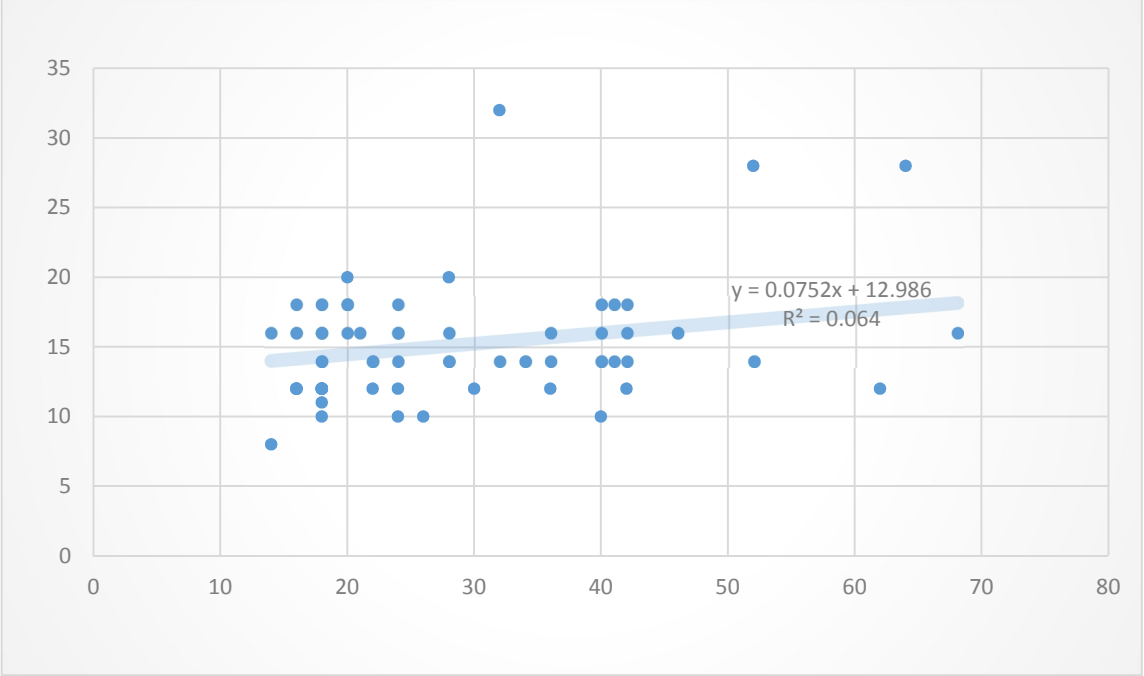


Fig 12: Relationship between Preoperative and postoperative IOP

Figure 12 shows a linear relationship between preoperative intraocular pressure and postoperative intraocular pressure with a correlation coefficient of 0.25.

11. DISCUSSION

In my Study, 59% of the patients were male and 41% female which is opposed to study by Khurana et al[127] in which 43% were male and 57% female. No significant age wise sex preponderance was noted. Among 75 patients operated, 45% were operated in right eye, 44% were operated in left eye, 11% were operated in both eyes as opposed to study by David L et al[126] in which 18% underwent bilateral surgery.

Our study showed that, 60% of the study population had POAG, 30% had PACG, 7% had SOAG, 3% had SACG which is similar to study by David L et al[126] in which 56% of the study population had POAG, 23% had PACG, 7% had SOAG.

In all age groups, patients with severe glaucomatous damage were higher when compared to moderate glaucomatous damage. Out of 83 eyes 78% had severe glaucomatous damage.

In my study number of eyes with severe glaucomatous damage was higher in all age groups (78%).

Out of 75 patients 3 patients had a family history of glaucoma. In my study 32% of patients had diabetes mellitus, 21% had systemic hypertension.

Nearly 13% of peripheral iridotomy were not patent in angle closure glaucoma patients. 55% of the patients were on no antiglaucoma medication, 20% were on beta blockers, 7% were on prostaglandin

analogue, 1% on α-agonist, 17% were using more than 1 antiglaucoma medication as opposed to study by Vinita R et al[130]in which 94.6% of eyes were using more than 1 antiglaucoma medication. Mean preoperative medication used was 1.36 ± 0.4 which is similar to study by Harsha et al [139] which used 1.6 ± 0.6 medications in the preoperative period.

The mean preoperative intraocular pressure was always higher in the group of patients who were on irregular antiglaucoma medication than those on regular medication irrespective of duration of glaucoma.

In my study Beta Blocker was not a significant risk factor for failure of trabeculectomy which is similar to study by Johnson et al[128]which described that there was no significant difference in success rate of trabeculectomy between eyes that previously used beta blockers and eyes that did not use beta blockers.

In my study the mean postoperative intraocular pressure was 15mmHg and the mean preoperative intraocular pressure 28.1mmHg.

In my study out of 78% of eyes which had severe glaucomatous damage, in 20% field could not be documented due to severe glaucomatous damage to optic disc and 22% had moderate field defects which is similar to study by usha et al[129]in which 29% had moderate field defect.

This study showed a linear relationship between preoperative and early postoperative control of intraocular pressure which is comparable to study

by Lochhead et al[133] Which showed a linear relationship between preoperative and postoperative intraocular pressure in trabeculectomy and phacotrabeculectomy.

In this study, 73% of eyes that had diffuse bleb at the end of 1 year and 27% had a flat bleb as opposed to study by usha et al[129]in which 32% eyes had a cystic bleb, 63% eyes had diffuse bleb and 5 % eyes had a flat bleb.

Nature of the bleb did not influence IOP in the study which was similar to study by usha et al[129].

In my study, eyes with early postoperative intraocular pressure of more than 10mmHg on day 5 or 13mmHg on day 10 postoperative day is associated with poor control of intraocular pressure at the end of 1 year with a significant p value of 0.003 and 0.0005 respectively, Relative risk 3.54, which is comparable with study by Rong SS et al[131] which described that IOP>10.5mmhg on day 1 or more than 13.5mmHg on postoperative day 7 the relative risk of failure was 4.2. The study concluded that increasing early intraocular pressure indicated a higher final intraocular pressure and patients with early low postoperative intraocular pressure had a higher success rate.

A study by Sandeep Mithal et al[142] reported that cases which had increase in intraocular pressure in the early postoperative period, majority of the cases failed within 6 months of surgery.

Study by Okimotos et al[132] concluded that an IOP under 8mmHg at 2 weeks after surgery was found to maintain postoperative IOP of either ≤ 11 mmHg and ≤ 15 mmHg for a extended period.

In my study a rise of pressure more than 4mmHg from the initial post operative IOP within 1 month is a risk factor for poor postoperative control of IOP at the end of 1 year which is similar to study by Hamed Esfandiari et al[134] which concluded that IOP change during the first month rather than each visit was a good predictor of failure and increase in more than 3 mmHg during the first 30 days was a good predictor of failure.

In my study vasularisation was found to be a risk factor for both flat bleb and poor control of intraocular pressure in the postoperative period with a significant p value of 0.0001 and 0.001 at 6 month follow up and 0.0001, and 0.012 respectively at 1 year which can be related to study by Shibal bhartiya et al[135] which proposed that failed blebs are usually flat and vascular.

A study by Sandra furrer et al[136] reported that excessive vascularisation showed a fair agreement with higher intraocular pressure post operatively.

Similarly Picht et al[137] concluded that early vascularisation is a indicator for poor prognosis with higher IOP at 12 months post operative period and supported the use of AntiVEGF agents.

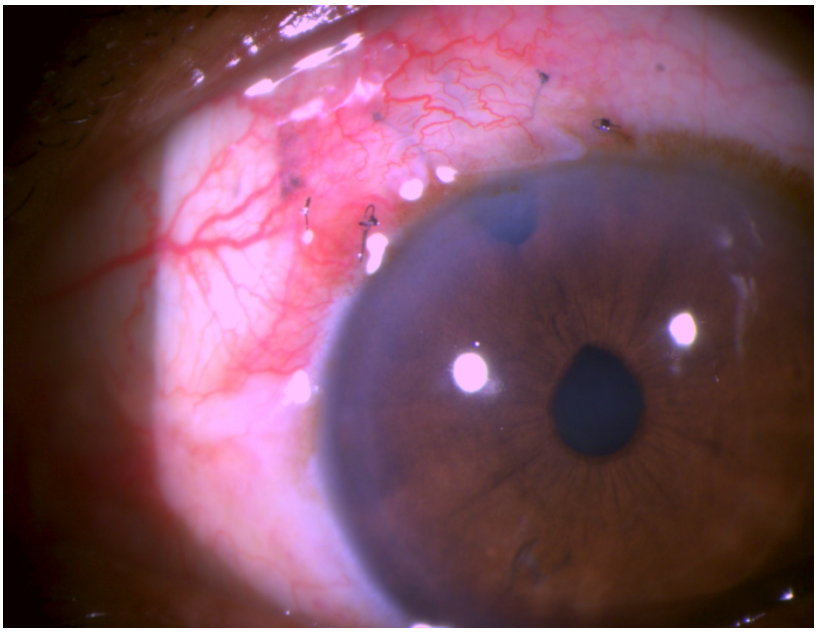
A study by Hamed Esfandiari et al[134] concluded that bleb morphological features did not predict failure except for bleb vascularity.

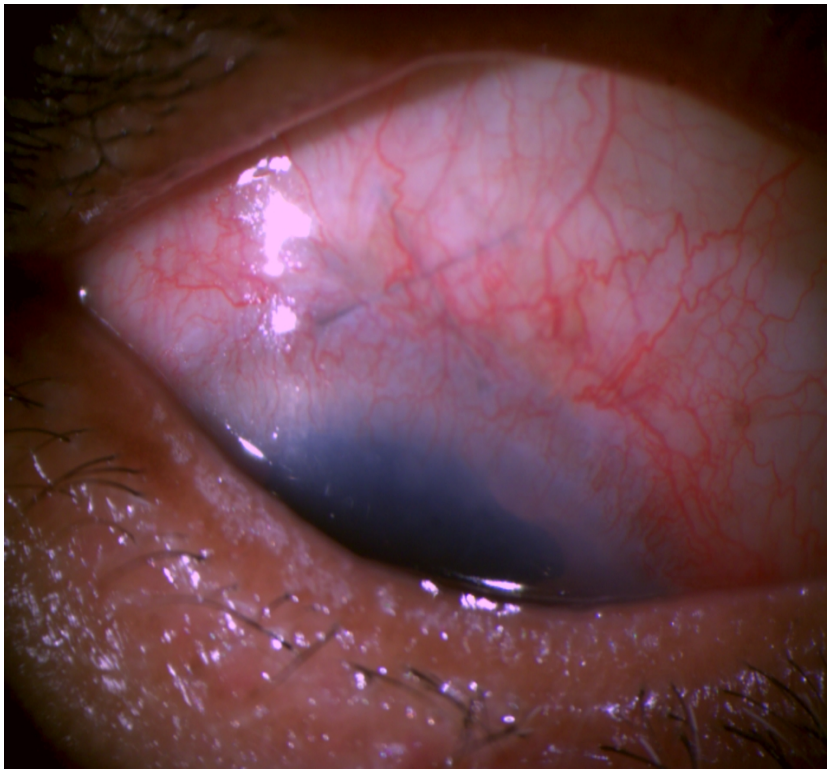
The qualified success rate in my study was 96% and the complete success rate was 60.5%. Complete success rate in POAG was 53%, qualified success was 98%. Complete success rate in PACG was 71%, qualified success in PACG was 100% which was similar to study by Harsha et al[139] in which PACG had better postoperative IOP control than POAG.

12. CONCLUSION

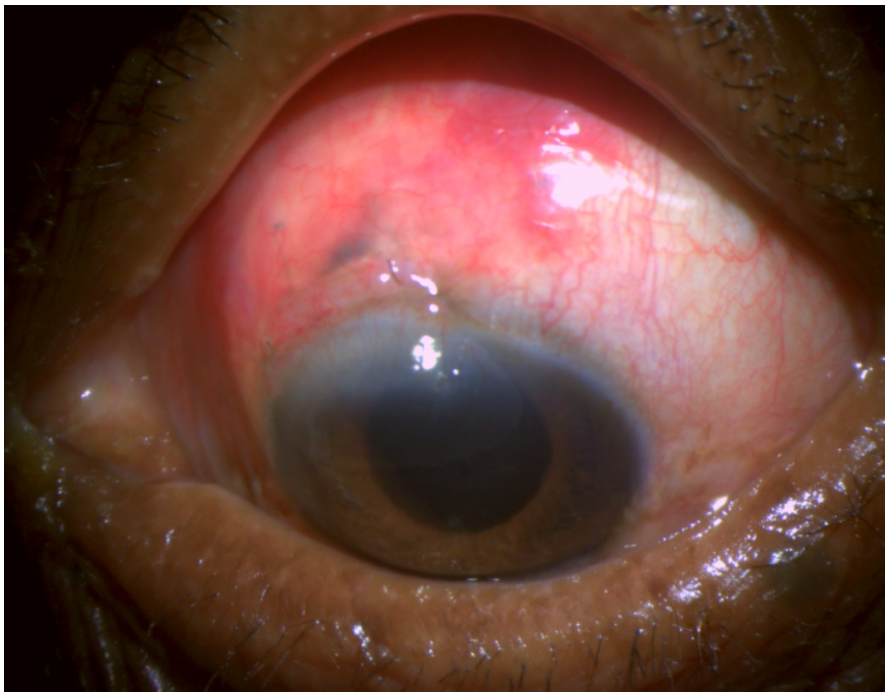
1. Complete success rate of combined small incision catatact surgery with trabeculectomy was 60.5%, and qualified success rate in my study was 96%.
2. Complete success rate in POAG was 53%, qualified success was 98%. Complete success rate in PACG was 71%, qualified success in PACG was 100%.
3. Early postoperative intraocular pressure of more than 10mmHg on day 5 or 13mmHg on day 10 postoperative day was found to be a risk factor for poor control of intraocular pressure at the end of 1 year.
4. Vascularisation of bleb at 6 months and 1 year was found to be a risk factor for flat bleb which can be attributed to withdrawal of steroids after 3 months of postoperative period.
5. The morphology of bleb does not correlate with long term intraocular pressure control at 1 year.

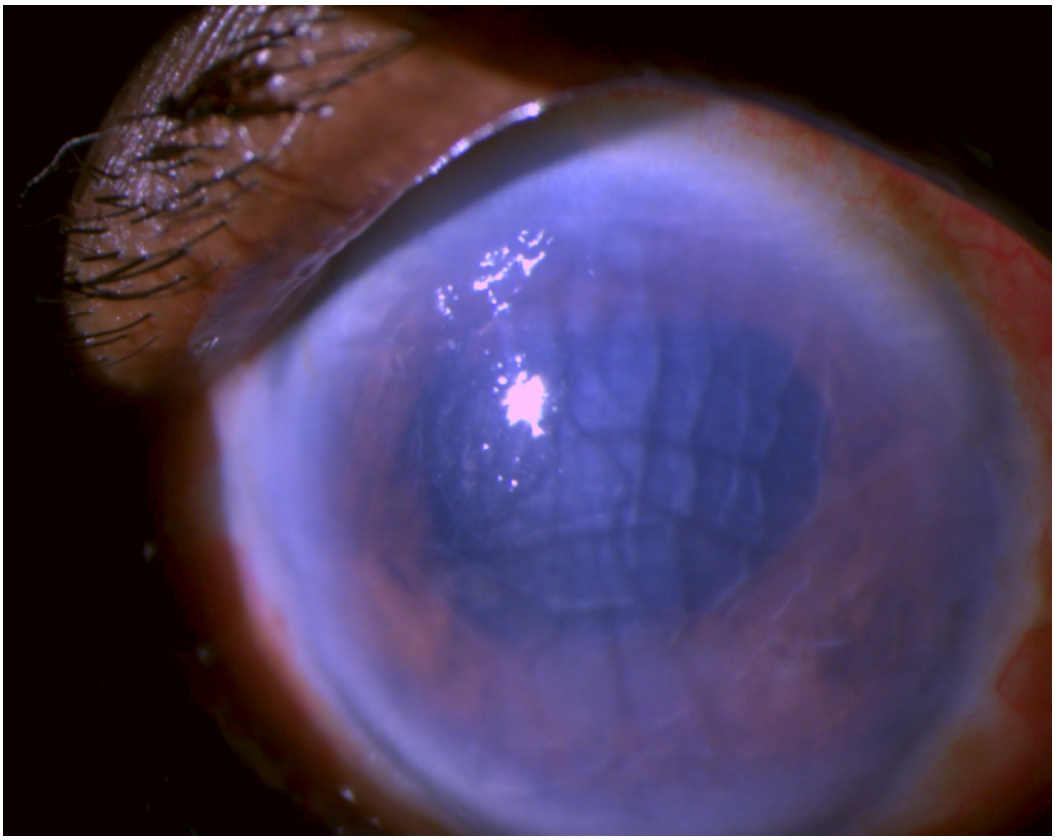
VASCULARISED BLEBS





VASCULARISED BLEBS





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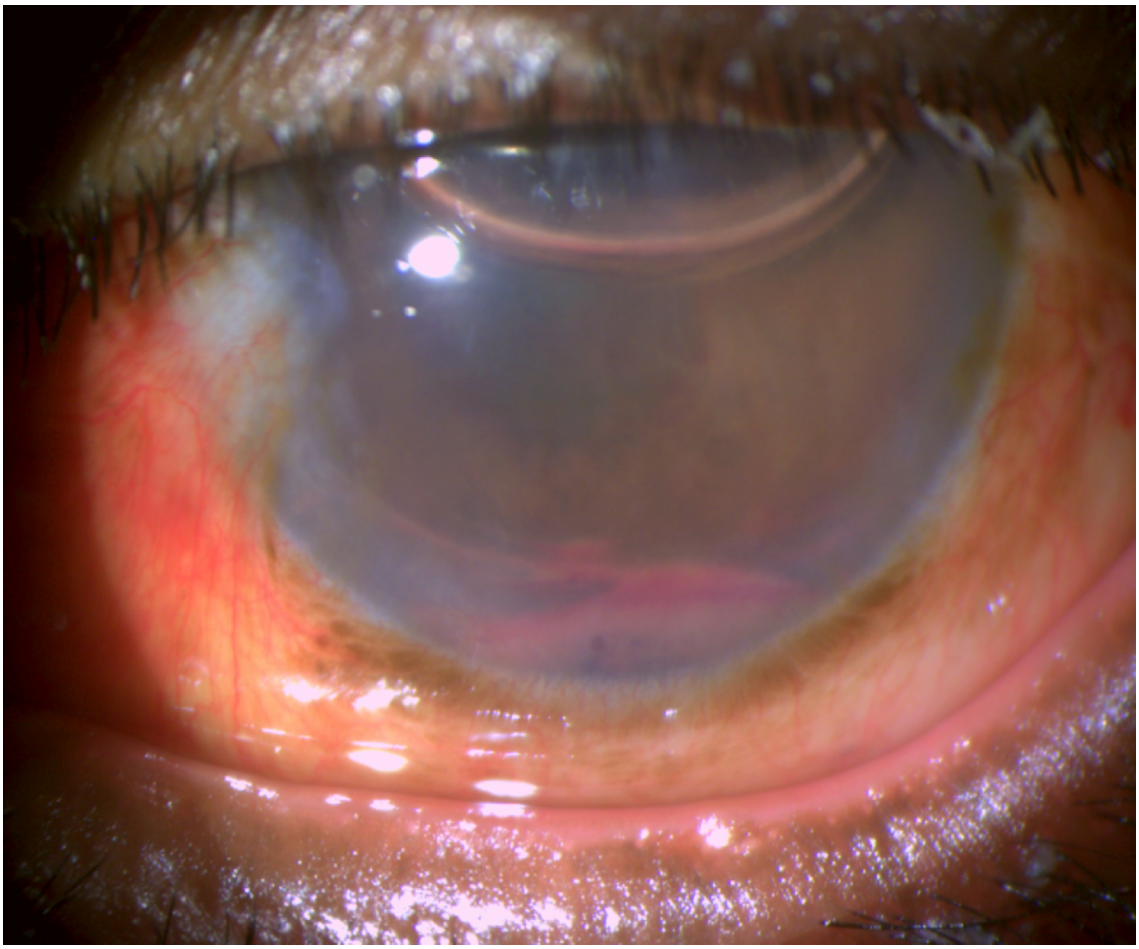

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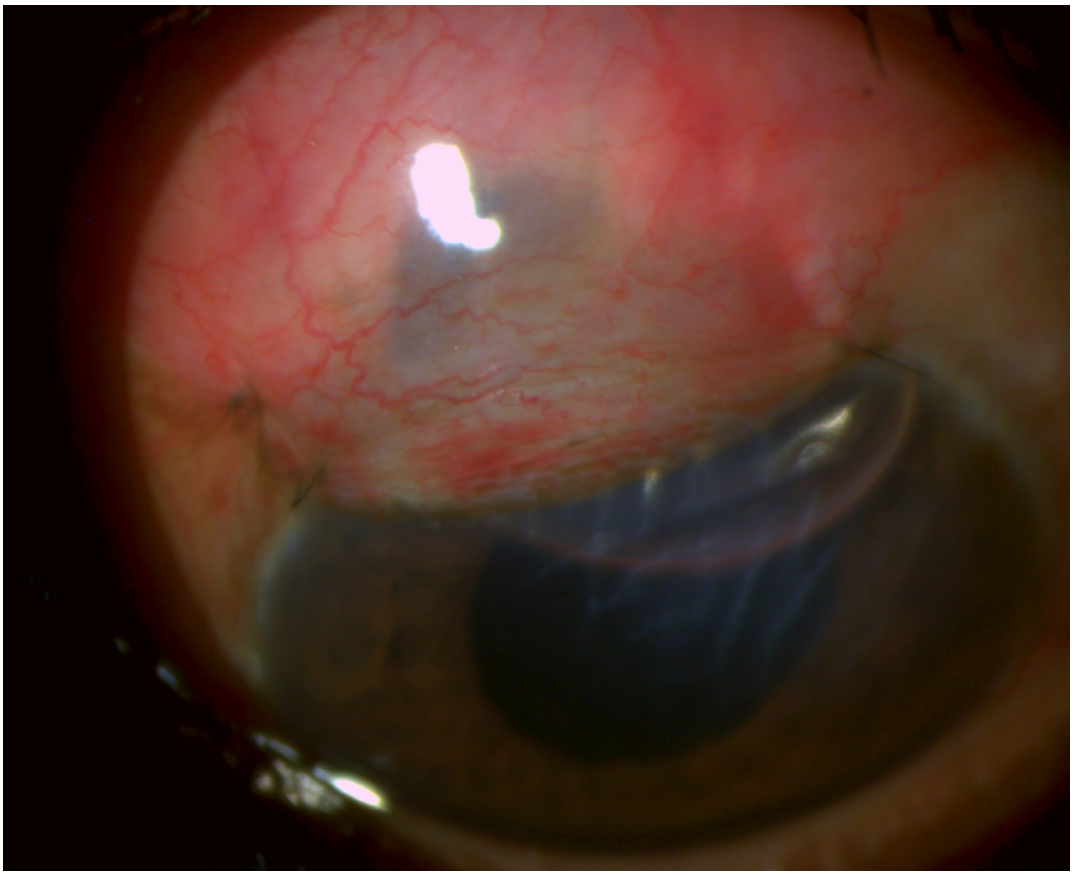

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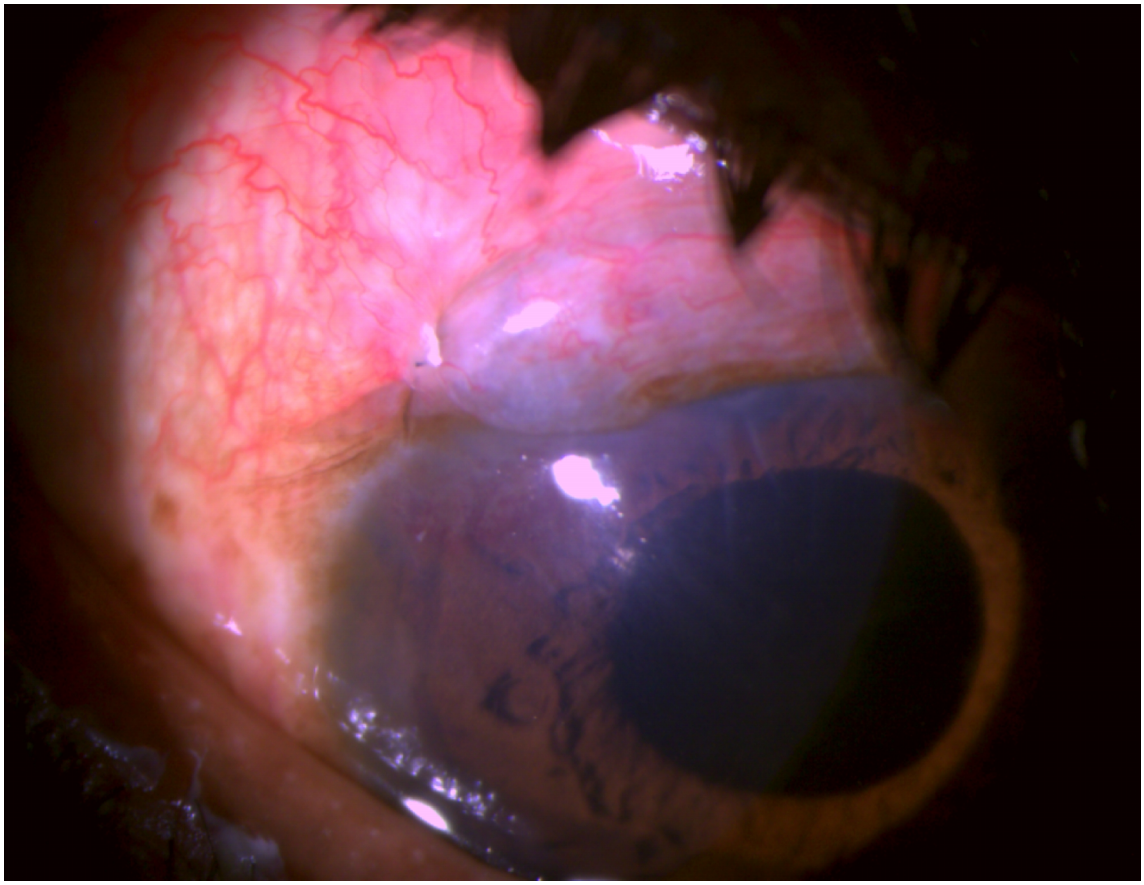
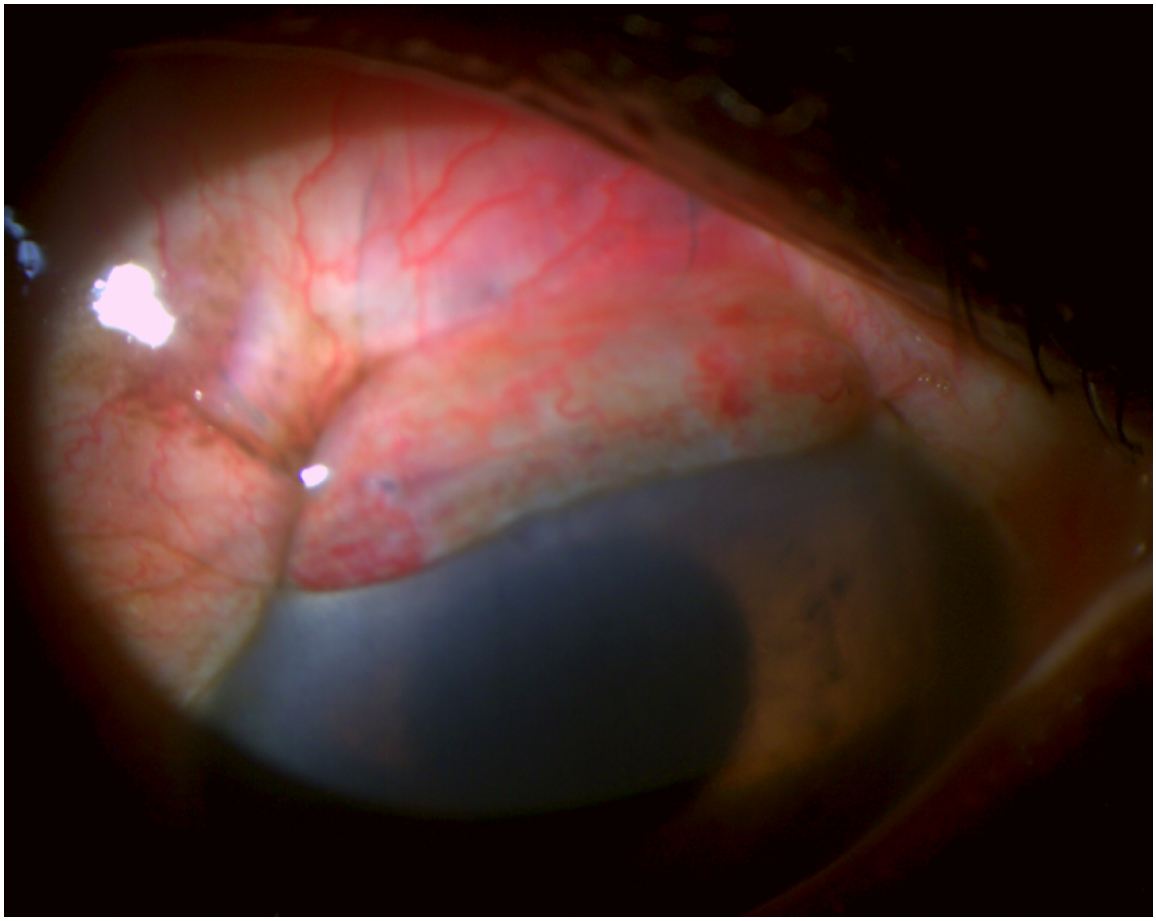


POST OPERATIVE DAY 5



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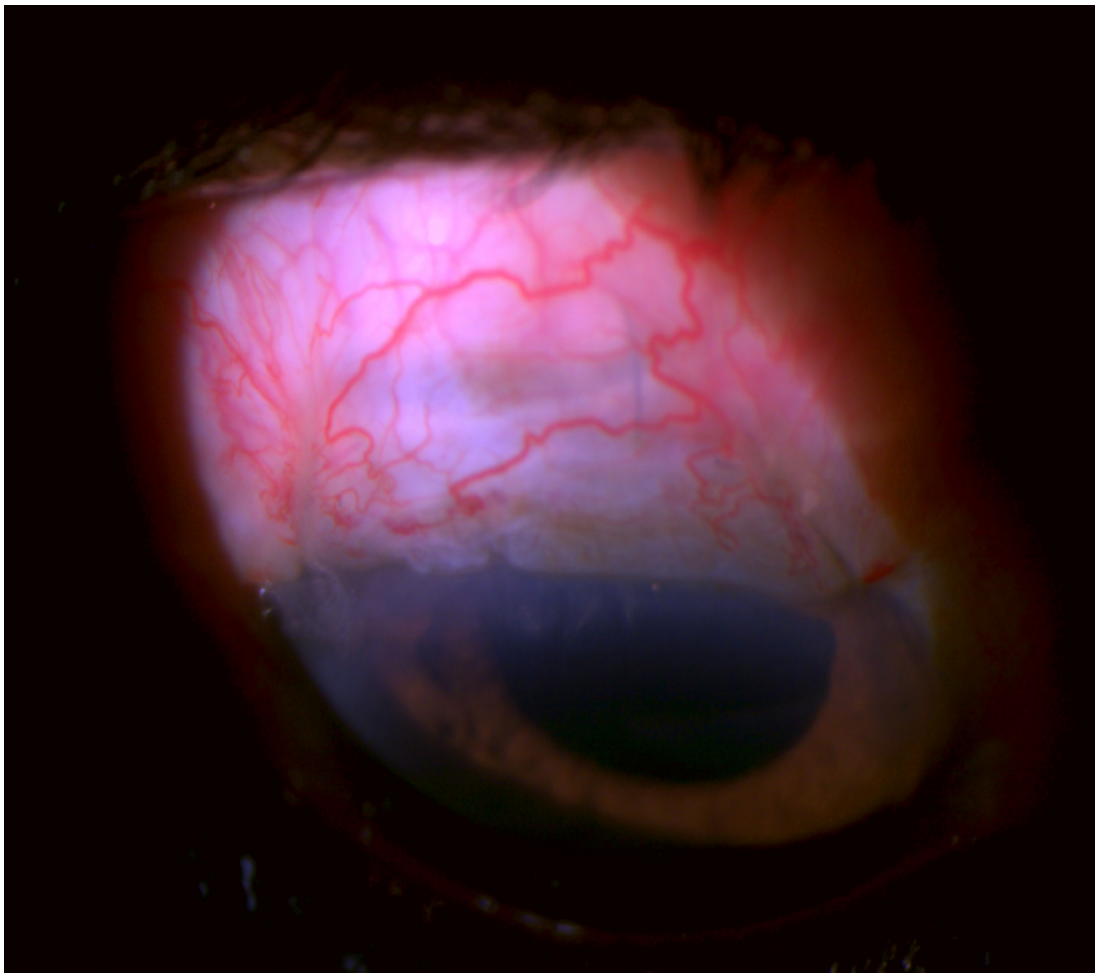

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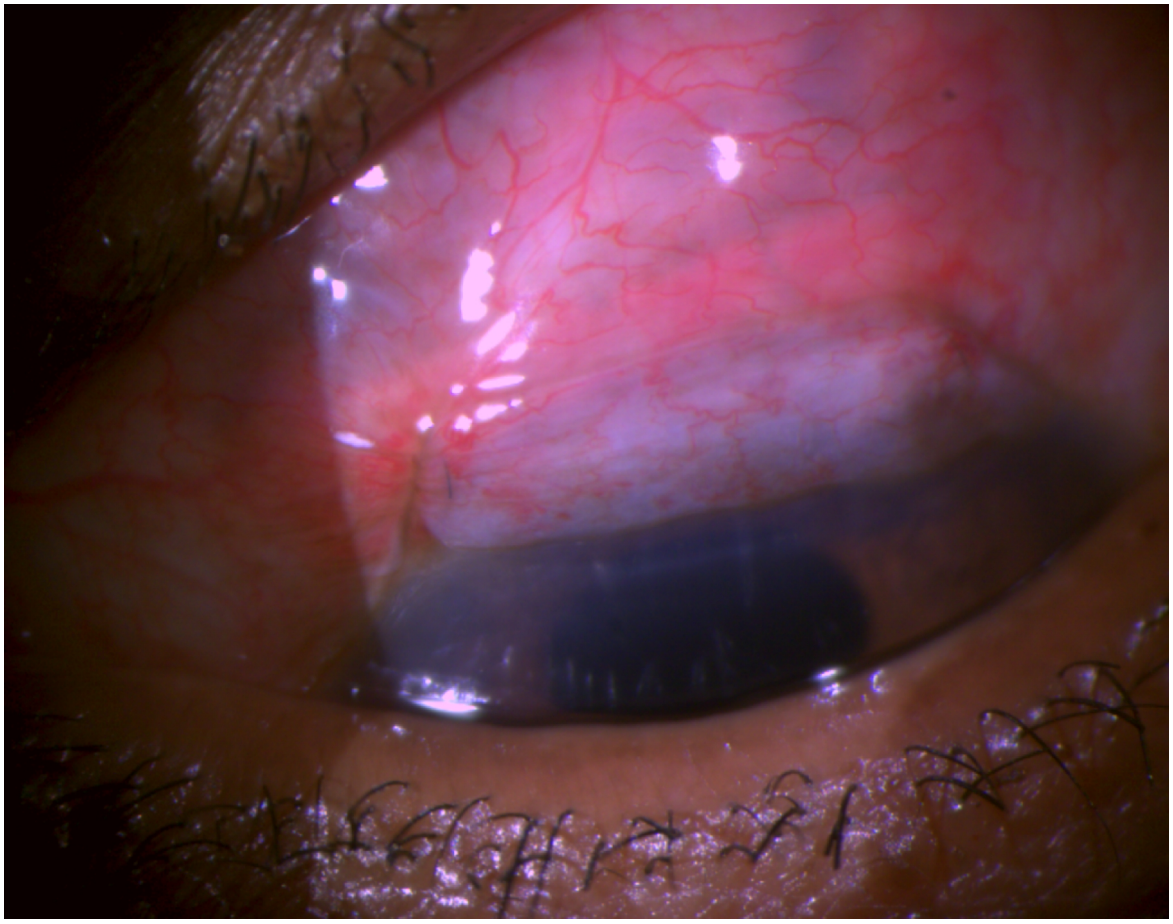

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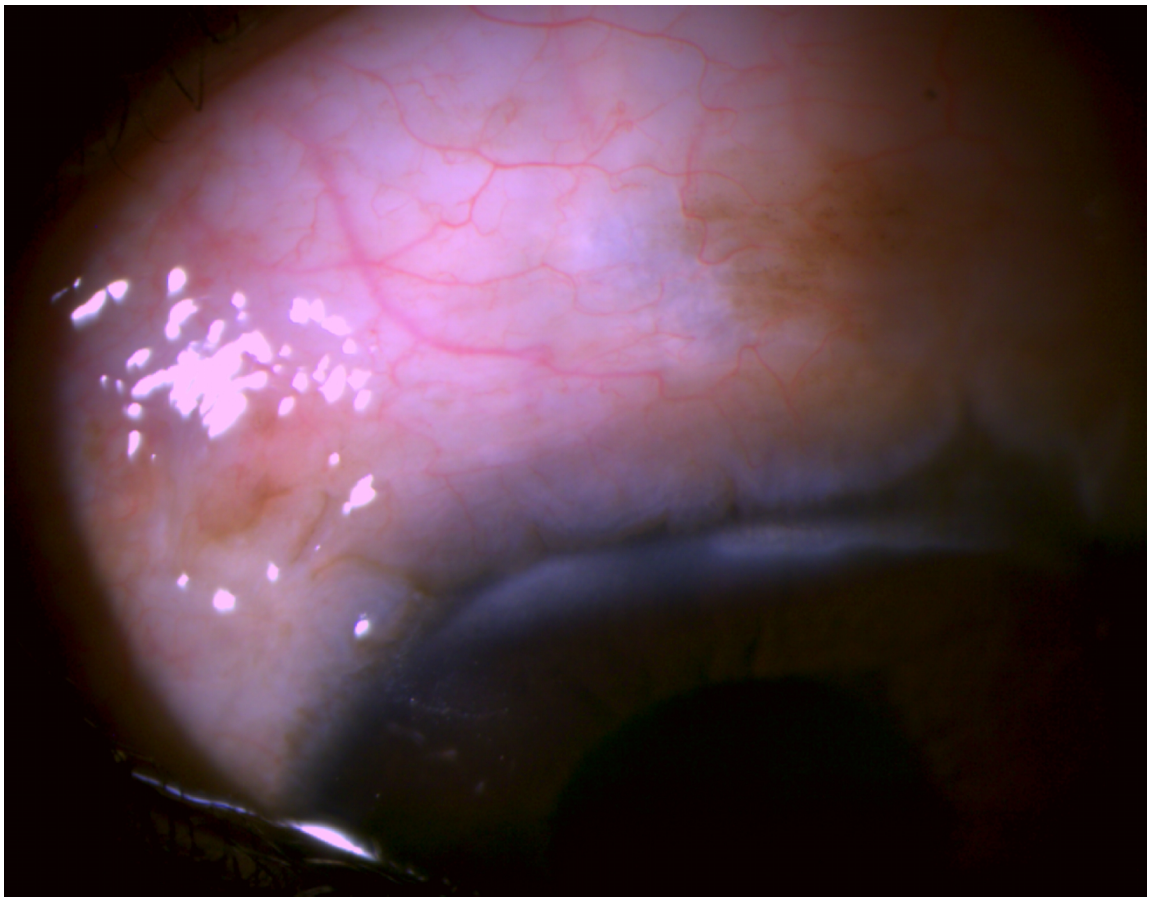
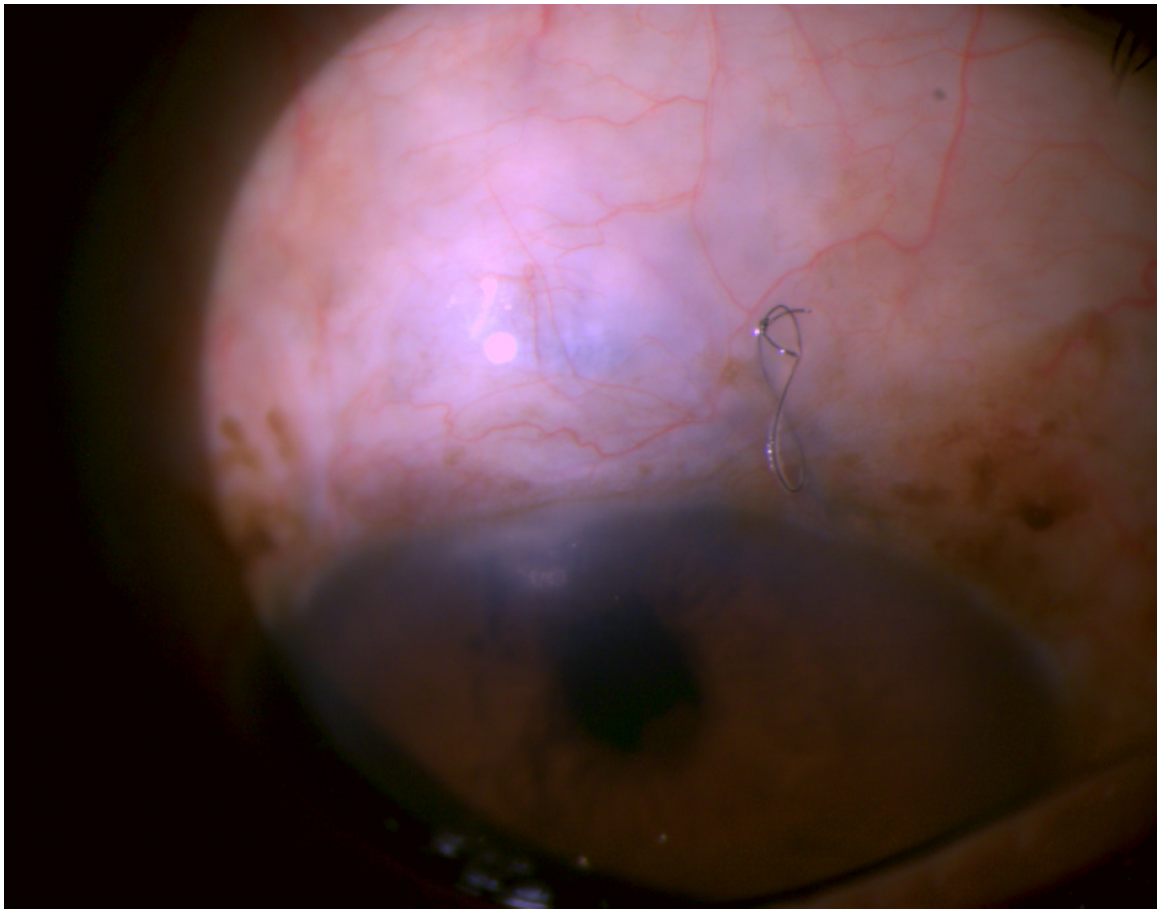


POST OPERATIVE 6 MONTHS



POST OPERATIVE 1 YEAR

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CASE PROFORMA

Name : Age /sex : IP NO :

Address : Mobile No : D.O.S :

Serial No :

History & Duration

- Defective vision - Headache - Pain

- Coloured halos - Frequent change of glasses

H/O use of Antiglaucoma Medication :

- Type of medication - duration - Regularity

H/O systemic illness: Diabetes/Hypertension/Bronchial asthma/CAD/others

Family History- yes/No

Type of glaucoma : POAG/PACG/SOAG/SACG Duration

PACG – PI 1. Done/Not Done

2. Duration

3. Patent/Not patent

Glaucomatous damage :RE Mild/Moderate/Severe/Normal

LE Mild/Moderate/Severe/Normal

IOP : RE : 5-10/11-20/21-30/31-40/41-50/>50 mmHg

LE : 5-10/11-20/21-30/31-40/41-50/>50 mmHg

Visual field : RE : Seidel/paracentral/Arcuate/Double Arcuate/Tubular/normal

LE : Seidel /paracentral/Arcuate/Double Arcuate/Tubular/normal

Gonioscopy : RE LE

UCVA RE LE

BCVA RE LE

SLE

RE : IMC/MC/HMC/Intumescent/Nuclear/PCIOL/Normal lens

LE : IMC/MC/HMC/Intumescent/Nuclear/PCIOL/Normal lens

FUNDUS

RE : CDR /BCLV/NRR Thinning/Notching/Bayonetting/

Nasalisation/Laminar dot sign/PPA/Spinter hemorrhages

LE : CDR /BCLV/NRR Thinning/Notching/Bayonetting/

Nasalisation/Laminar dot sign/ PPA/Spinter hemorrhages

DIAGNOSIS **PROCEDURE**:

POSTOPERATIVE EVALUATION

	D1	D5	D10	1m	6m	12m
UCVA						
BCVA						
SLE						
Morphology Of Bleb						
PI morph						
Ac depth						
Corneal edema						
CD ratio						
AT						
Fields						
Antiglaucoma medication – Needed/Not						

COMPLICATIONS :

EARLY	LATE
Corneal edema	Blebitis
Hyphaema	Endophthalmitis
Flat AC	Failed Bleb
Overfiltering bleb	IOP rise
Hypotony /woundleak	Field Progression
Increase in IOP	
Striate keratopathy	
IOL Dislocation	
Iritis/PAS	
Closed PI	
Choroidal Detachment	
Endophthalmitis	
Malignant Glaucoma	

ABBREVIATIONS USED IN EXCEL SHEET

Sex

1- Male

2- Female

Defective vision

1- Right eye

2- Left eye

3- Both eyes

Systemic illness

1- Diabetes

2- Hypertension

3- Bronchial Asthma

4- Coronary Artery Disease

5- Others

6- Diabetes and Hypertension

7- No systemic illness

Family History

1. Present

2. Absent

H/O Antiglaucoma Medication

1- Present

2- Absent

Type of Medication

1- Beta Blocker

2- Prostaglandin Analogue

3- Cholinergic Agonist

4- Adrenergic Agonist

5- Carbonic Anhydrase Inhibitor

6- Hyperosmotic Agents

Regularity of Medication

1- Regular

2- Irregular

Type of Glaucoma

1- POAG

2- PACG

3- SOAG

4- SACG

Peripheral Iridotomy

1-Done

2-Not Done

1-Patent

2-Not patent

M-Months

Y- Years

Glaucomatous Damage

1-Normal

2-Mild

3-Moderate

4-Severe

IOP

1. 5-10mmHg
2. 11-20mmHg
3. 21-30mmHg
4. 31-40mmHg
5. 41-50mmHg
6. >50mmHg

Visual field

1. Normal
2. Seidel scotoma
3. Paracentral scotoma
4. Arcuate
5. Double Arcuate
6. Tubular vision
7. No view

Lens changes

1- Immature Cataract
2- Nuclear Cataract
3- Mature Cataract
4- Hypermature Cataract
5- PCIOL
6- Normal crystalline lens

Duration of Glaucoma

1- Less than 1 year
2- 1-5 years
3- 6-10 years
4- >10 years

Eye operated

1- Right eye

2- Left eye

3- Both eyes

Morphology of bleb

1- Polycystic bleb

2- Diffuse bleb

3- flat bleb

4- Encysted bleb

V- Vascularised bleb

AC depth

1- Shallow

2- Normal

3- Deep

Corneal edema

1- Present

2- Absent

NV – Not visualised

Complications

1- Corneal edema

2- Hypotony

3- Iritis

4- Increased IOP

5- Shallow AC

6- Hyphaema

7- Striate Keratopathy

8- Field Progression

9- Closed PI

10- Peripheral Anterior Synechiae

11- None

Postoperative AGM

1. Needed
2. Not needed

Sl. No.	Name	Age	Sex	Defective vision		Systemic illness	Family history	H/O AGM	Regulariity	Glaucomatous damage		IOP		Visual field		Gonioscopy		Vision		Lens changes		CDR		Eye operated
				eye	duration					RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	
1	Saravana muthuvel	68	1	3	6 months	1	2	1	1	4	4	2	2	6	6	III	III	+0.3	+0.2	2	2	0.8	0.8	3
2	Sabiyal	58	2	1	1 year	7	2	2	_	4	4	2	2	5	5	III	III	+0.3	+0.3	1	1	0.7	0.7	1
3	Rajeshwari	59	2	1	6 months	7	2	1	1	4	1	5	2	7	1	0	II	PL	+0.3	1	1	0.9	0.3	1
4	Mohanraj	75	1	1	6 months	1	2	1	1	4	4	2	2	6	6	III	III	+0.8	+0.5	1	5	0.9	0.9	1
5	Shanmugathamma	64	2	1	2 years	4	2	1	2	4	3	3	2	7	4	II	III	PL	+0.3	1	5	0.9	0.7	1
6	Subramaniyam	70	1	2	3 months	2	2	1	1	4	3	2	2	7	4	II	0	+1.47	+1.0	5	1	0.9	0.7	2
7	Jeyakumar	52	1	3	2 years	7	2	1	1	4	4	2	3	5	5	III	III	+1.47	+0.6	5	1	0.9	0.9	2
8	Murugan	70	1	3	3 years	1	2	1	1	3	4	2	2	4	6	III	III	+1.07	+0.3	2	5	0.7	0.9	1
9	Abdul Ajeesh	52	1	1	3 years	7	2	1	2	4	3	3	3	5	4	III	III	+0.8	+0.3	2	2	0.8	0.6	1
10	Subramaniyam.M	67	1	3	2 years	7	2	1	1	4	3	3	3	7	4	II	III	+1.77	+0.6	1	2	0.9	0.6	2
11	Paapa	70	2	1	6 months	1	2	1	2	4	2	4	3	7	2	II	III	PL	+0.2	2	5	0.9	0.3	1
12	Jeyakodi	50	2	1	2 years	7	2	2	_	3	3	3	2	4	4	I	III	+1.17	+0.6	2	5	0.6	0.6	1
13	Esakkimuthu	65	1	2	4 years	7	2	2	_	4	4	3	2	5	7	III	III	+0.8	+2.28	5	2	0.8	0.9	2
14	Kala	60	2	2	6 months	7	2	2	_	4	4	5	5	5	5	I	I	+0.5	+1.0	2	2	0.9	0.9	2
15	Paramasivan	71	1	1	3 years	7	2	1	2	4	4	2	3	5	7	II	I	+0.6	No PL	2	2	0.9	0.9	1
16	Harikrishna	60	1	3	1 year	1	2	2	_	4	3	4	2	7	4	I	I	+2.28	+0.5	2	2	0.9	0.6	3
17	Jyothi	62	2	3	4 years	1	2	2	_	3	3	2	2	4	4	III	III	+0.5	+1.0	2	2	0.6	0.4	1
18	Sundari	65	2	2	1 year	7	2	2	_	4	4	4	4	7	5	III	III	No PL	+0.6	1	1	0.9	0.8	2
19	Seeniammal	70	2	2	6 months	4	2	2	_	4	4	2	3	5	7	III	0	+0.5	PL	5	3	0.7	NV	2
20	Subramaniyan	65	1	2	1 year	7	2	2	_	4	3	4	3	7	4	III	III	+1.47	+0.8	1	2	0.9	0.6	2
21	Selvakumari	59	2	3	2 years	7	2	1	2	4	4	3	3	6	6	II	II	+0.0	+0.6	2	2	0.9	0.9	2
22	Madathi	60	2	2	1 year	7	2	2	_	3	3	2	2	4	4	II	II	+0.3	+0.6	5	2	0.6	0.7	2
23	Esakkiammal	51	2	1	6 months	7	2	2	_	4	1	6	2	7	1	–	III	PL	+0.3	1	1	N	0.3	1
24	Murugiah	72	1	2	6 months	1	2	1	2	4	3	2	3	5	4	I	0	+0.5	+0.8	5	2	0.7	0.6	2
25	Muthukumar	46	1	2	1 year	2	2	1	1	2	4	3	2	3	5	I	I	+0.3	+1.0	1	1	0.5	0.9	2
26	Palani	69	1	1	1 year	6	2	2	_	4	3	2	2	6	4	III	III	+1.07	+0.5	2	2	0.8	0.7	1
27	Ramalakshmi	62	2	3	4 months	6	2	1	2	3	3	2	2	4	4	III	III	+0.6	+0.5	2	2	0.8	0.7	1
28	Selvaraj	71	1	3	2 years	7	2	1	2	4	4	5	6	5	7	III	III	+1.17	No PL	2	2	0.9	NV	1
29	Murugavel	53	1	2	3 months	1	2	1	2	1	4	2	5	1	5	III	0	+0.5	+0.6	1	1	0.3	0.9	2
30	Sankaralingam	76	1	3	1 year	6	2	2	_	4	4	5	5	7	5	I	I	No PL	+1.07	2	2	N	0.7	2
31	Samuel	65	1	2	6 months	7	2	1	_	4	3	2	2	5	4	III	III	+1.07	+1.0	5	2	0.8	0.7	2
32	Shemban	45	1	3	1 year	7	2	2	_	4	4	6	6	7	7	0	0	PL	+1.77	3	3	N	NV	1
33	chellammal	57	2	3	6 months	2	2	2	_	1	4	2	6	1	7	I	0	+1.0	PL	1	1	0.3	0.9	2
34	Uma maheshwari	65	2	1	1 year	6	2	1	2	4	2	3	2	5	3	0	III	PL	+0.3	2	5	0.8	0.5	1
35	Avudaiappan	60	1	2	1 year	1	2	2	_	4	4	4	4	5	5	III	III	+0.5	+0.6	1	1	0.9	0.8	2
36	Muruganandam	49	1	2	4 months	7	2	2	_	2	4	2	4	3	5	0	0	+0.5	+0.6	1	1	0.5	0.7	2
37	Murugan	59	1	2	3 days	7	2	2	_	2	4	2	6	3	7	I	I	+0.5	PL	1	1	0.4	0.9	2
38	Backiyathai	70	2	3	1 year	7	2	2	_	2	4	2	2	2	5	III	III	+0.6	+0.6	1	1	0.4	0.8	2
39	Poochendu	63	2	3	6 months	7	2	2	_	4	4	2	2	5	5	II	II	+0.6	+0.6	1	1	0.9	0.8	3
40	Radhakrishnan	68	1	3	2 years	7	2	2	_	4	4	4	3	6	7	III	III	+1.0	PL	2	5	0.8	0.9	1
41	Bojarajan	71	1	1	6 months	7	1	1	2	4	2	4	2	6	2	III	III	+0.2	+0.3	2	5	0.9	0.4	1
42	Arumugam	41	1	3	3 months	7	2	2	_	3	3	2	2	4	4	III	III	+0.5	+1.0	1	1	0.8	0.8	3
43	Chelladurai	55	1	2	3 months	7	2	2	_	1	3	2	4	1	4	III	II	+0.5	+2.28	5	1	0.3	0.7	2
44	Vaithiyalingam	65	1	3	3 years	7	2	1	1	4	4	2	3	7	5	II	III	+2.28	+0.5	5	2	0.9	0.7	2
45	Iruthayaraj	55	1	1	6 months	7	2	1	2	3	4	4	6	4	7	II	II	+0.6	No PL	1	1	0.5	0.9	3
46	Thangadurai	69	1	1	1 year	7	1	2	_	4	2	4	2	6	3	III	III	+1.0	+0.5	1	5	0.9	0.4	1
47	Kaliammal	66	2	3	1 year	2	2	2	_	4	4	5	2	7	5	II	II	+2.28	+1.0	2	5	0.7	0.9	1
48	Sudalaiandi	60	1	1	3years	7	2	2	_	4	2	5	2	7	3	II	III	+1.77	1	2	2	N	0.3	1
49	Jeyalakshmi	55	2	1	1year	1	2	1	2	4	2	3	3	5	4	II	II	+0.6	+0.77	2	2	0.7	0.7	1
50	Bhavani	56	2	1	1year	3	2	2	1	4	3	2	2	5	4	III	III	+1.00	+0.77	1	1	0.7	0.6	3
51	Shanmugathai	64	2	1	2 years	7	2	1	2	4	3	3	2	7	4	II	III	PL	+0.3	1	5	0.9	0.7	1
52	Sundaram	65	1	3	1 year	7	2	2	_	4	4	4	4	7	5	III	III	PL	+0.6	1	1	0.9	0.8	2
53	Selvamani	59	2	3	2 years	1	2	1	2	4	4	3	3	6	6	II	II	+0.0	+0.6	2	2	0.9	0.9	2
54	Sangaperumal	76	1	3	1 year	6	2	2	_	4	4	5	5	7	5	I	I	No PL	+1.07	2	2	N	0.7	2
55	Sethuammal	57	2	3	6 months	2	2	2	_	1	4	2	6	1	7	I	0	+1.0	PL	1	1	0.3	0.9	2

Sl. No.	Name	Age	Sex	Defective vision		Systemic illness	Family history	H/O AGM	Regulariity	Glaucomatous damage		IOP		Visual field		Gonioscopy		Vision		Lens changes		CDR		Eye operated
				eye	duration					RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	RE	LE	
56	Ulagammal	65	2	1	1 year	6	2	1	2	4	2	3	2	5	3	0	III	PL	+0.3	2	5	0.8	0.5	1
57	Annamalai	60	1	2	1 year	7	2	2	_	4	4	4	4	5	5	III	III	+0.5	+0.6	1	1	0.9	0.8	2
58	Kovilpitchai	76	1	3	1 year	6	2	2	_	4	4	5	5	7	5	II	II	No PL	+1.07	2	2	N	0.7	2
59	Mallika	56	2	3	3 years	6	2	1	2	4	4	2	3	5	7	II	I	+0.6	PL	2	2	0.9	0.9	1
60	paulthai	50	2	1	1year	7	2	2	1	4	3	2	2	5	4	III	III	+1.00	+0.77	1	1	0.7	0.6	1
61	Beerkannu	60	1	1	1 year	3	2	2	_	4	4	2	2	5	5	III	III	+0.3	+0.3	1	1	0.7	0.7	1
62	Subbammall	58	2	1	1 year	7	2	2	_	4	4	2	2	5	5	III	III	+0.3	+0.3	1	1	0.7	0.7	1
63	Padmanathan	56	1	1	6 months	2	2	1	1	3	4	4	2	4	5	III	III	+0.2	+0.3	2	2	0.6	0.8	2
64	Moses	60	1	2	6 months	6	2	1	2	4	3	2	3	5	4	I	0	+0.5	+0.8	5	2	0.7	0.6	2
65	Velladurai	70	1	3	2 years	7	2	1	2	4	4	2	3	5	5	III	III	+1.47	+0.6	5	1	0.9	0.9	2
66	Perumal	60	1	3	6 months	1	2	1	1	4	4	2	2	6	6	III	III	+0.3	+0.2	2	2	0.8	0.8	1
67	Krishnaveni	60	2	1	1 year	7	2	2	_	4	4	2	2	5	5	III	III	+0.3	+0.3	1	1	0.7	0.7	1
68	Raniammal	70	1	3	6 months	1	2	1	1	4	4	2	2	6	6	III	III	+0.3	+0.2	2	2	0.8	0.8	3
69	Sornam	53	2	3	1 year	7	2	2	_	2	4	2	2	2	5	III	III	+0.6	+0.6	1	1	0.4	0.8	2
70	Poomari	60	2	2	6 months	7	2	2	2	4	4	5	5	6	6	I	I	+0.5	+1.0	2	2	0.9	0.9	2
71	Karupasamy	62	1	3	4 months	1	2	1	2	3	3	2	2	4	4	III	III	+0.6	+0.5	2	2	0.8	0.7	1
72	Dharmaraj	68	1	1	6 months	1	2	1	_	4	2	4	2	7	2	0	II	PL	+0.3	4	5	N	0.4	1
73	Karupiah	66	1	3	1 year	2	2	2	_	4	4	5	2	5	0.9	II	II	+2.28	+1.0	2	5	0.7	0.9	1
74	Sudalaimuthu	60	1	1	3year	7	2	2	_	4	2	5	2	7	3	II	III	+1.77	1	2	2	0.9	0.3	1
75	Natrajan	45	1	2	2year	7	1	1	1	4	4	3	3	5	5	I	II	0.47	0.47	1	1	0.9	0.9	3

Eye	duration of glaucoma	type of Medication	Duration of AGM	Type of glaucoma	PI	Patency	DAY 1						DAY 5						Day 10						1 Month						3 Month						6 Month						1 year						post op IOP 1 yr	target iop	CDR at 1 yr	field at presentation	field 6 months	field I year	postop AGM use	Complications
							BCVA	Morphology of bleb	PI Patency	AC depth	Corneal edema	IOP	BCVA	Morphology of bleb	PI patency	AC Depth	Corneal edema	IOP	BCVA	Morphology of bleb	PI patency	AC Depth	Corneal edema	IOP	Bcva	Morphology of bleb	PI Patency	AC Depth	Corneal edema	IOP	Bcva	Morphology of bleb	PI Patency	AC Depth	Corneal edema	IOP	BCVA	Morphology of Bleb	PI Patency	AC Depth	Corneal Edema	IOP	BCVA	Morphology of Bleb	PI Patency	AC Depth	Corneal Edema	IOP							
1	2	1	6 m	1	2	–	RE +0.8	2v	1	2	1	5	RE +0.6	2v	1	2	2	6	RE +0.6	2v	1	2	2	6	RE +0.3	2	1	2	2	11	RE +0.3	2	1	2	2	11	RE +0.3	2	1	2	2	11	RE +0.3	3	1	2	2	12	12	0.9	6	6	6	1	2
2	2	1	6m	1	2	_	LE +0.8	2v	1	2	2	8	LE +0.6	2v	1	2	2	6	LE +0.6	2v	1	2	2	6	LE +0.3	2	1	2	2	10	LE +0.3	2	1	2	2	10	LE +0.2	2	1	2	2	12	LE +0.2	3	1	2	2	12	12	0.9	6	6	6	1	2
3	1	–	–	1	2	–	+0.8	3v	1	2	2	10	+0.3	3v	1	2	2	14	+0.3	3v	1	2	2	14	+0.2	2	1	2	2	18	+0.2	2	1	2	2	16	+0.2	2	1	2	2	18	+0.2	2	1	2	2	18	14	0.7	5	5	5	1	No
4	2	1,3	6 m	2	1	1	PL	3v	1	2	2	20	PL	3v	1	2	2	18	PL	3v	1	2	2	18	PL	2	1	2	2	18	PL	2	1	2	2	18	PL	2	1	2	2	20	PL	2	1	2	2	18	13	0.9	7	7	7	1	No
5	2	4	3 y	1	2	–	+0.6	2v	1	2	2	10	+0.6	2v	1	2	2	18	+0.6	2v	1	2	2	18	+0.6	3	1	2	2	18	+0.6	3	1	2	2	18	+0.2	3v	1	2	2	18	+0.2	3v	1	2	2	18	11	0.9	6	6	6	1	No
6	1	1,4	3 m	1	2	–	PL	2v	1	2	2	8	PL	2v	1	2	2	10	PL	2v	1	2	2	10	PL	2	1	2	2	14	PL	2	1	2	2	14	PL	2	1	2	2	14	PL	2	1	2	2	16	13	0.9	7	7	7	2	No
7	1	1	8 m	2	1	1	+1.0	2v	1	2	2	10	+0.5	2v	1	2	2	10	+0.5	2v	1	2	2	10	+0.5	2	1	2	2	8	+0.5	2	1	2	2	8	+0.5	2	1	2	2	10	+0.5	3	1	2	2	12	11	0.7	4	4	4	2	7
8	2	2	2 y	1	2	–	+0.8	2v	1	2	2	12	+0.6	2v	1	2	2	12	+0.6	2v	1	2	2	12	+0.2	2	1	2	2	14	+0.2	2	1	2	2	14	+0.2	3	1	2	2	14	+0.2	3	1	2	2	14	13	0.9	5	5	6	1	8
9	2	1,5	1 y	1	2	–	+0.8	2v	1	2	2	10	+0.8	2v	1	2	2	14	+0.8	2v	1	2	2	14	+0.8	2	1	2	2	10	+0.8	2	1	2	2	10	+0.8	3	1	2	2	10	+0.8	3	1	2	2	8	10	0.7	4	4	4	1	3
10	1	1	4 m	1	2	–	+0.6	2v	1	2	2	10	+0.6	2v	1	2	2	14	+0.6	2v	1	2	2	14	+0.3	3	1	2	2	14	+0.3	3	1	2	2	14	+0.3	3	1	2	2	12	+0.3	3	1	2	2	12	13	0.8	5	5	5	1	No
11	2	1	4 y	1	2	–	+1.0	3v	1	2	2	10	+1.07	3v	1	2	2	12	+1.07	3v	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	+0.8	3v	1	2	2	12	+0.8	3v	1	2	2	14	15	0.6	4	4	4	1	No
12	1	1	6 m	1	2	–	+2.28	3v	1	2	2	10	+2.28	3v	1	2	2	14	+2.28	3v	1	2	2	14	+2.28	2	1	2	2	14	+2.28	2	1	2	2	14	+2.28	3	1	2	2	11	+2.28	3	1	2	2	14	13	0.9	7	7	7	1	No
13	1	–	–	2	1	1	+0.6	3v	1	2	2	10	+0.5	3v	1	2	2	12	+0.5	3v	1	2	2	12	+0.5	2	1	2	2	14	+0.5	2	1	2	2	12	+0.5	3	1	2	2	14	+0.5	3v	1	2	2	14	15	0.7	4	4	5	1	8
14	2	–	–	1	2	–	+2.28	2v	1	2	2	12	+2.28	2v	1	2	2	14	+2.28	2v	1	2	2	14	+2.28	2	1	2	2	16	+2.28	2	1	2	2	16	+2.28	2	1	2	2	16	+2.28	2	2	2	2	18	13	0.9	7	7	7	1	9
15	1	–	–	2	2	–	+0.8	2v	1	2	2	8	+0.8	2v	1	2	2	8	+0.8	2v	1	2	2	8	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	14	13	0.9	5	5	5	2	No
16	2	2	2 y	2	1	2	+1.0	2v	1	2	2	8	+1.0	2v	1	2	2	8	+1.0	2v	1	2	2	8	+1.0	2	1	2	2	10	+1.0	2	1	2	2	10	+1.0	2	1	2	2	10	+1.0	2	1	2	2	11	12	0.9	5	5	5	1	10
17	1	–	–	2	1	1	RE +2.28	2v	1	2	2	22	+2.28	2v	1	2	2	14	+2.28	2v	1	2	2	14	+2.28	3	1	2	2	14	+2.28	3	1	2	2	14	+2.28	3	1	2	2	18	+2.28	3	1	2	2	18	13	0.9	7	7	7	1	No
18	1	_	_	2	1		LE +0.5	2v	1	2	2	12	+0.5	2v	1	2	2	12	+0.5	2v	1	2	2	12	+0.5	3	1	2	2	12	+0.5	3	1	2	2	12	+0.5	3v	1	2	2	18	+0.5	3v	1	2	2	20	15	0.6	4	4	4	1	No
19	1	–	–	1	2	–	+0.5	2v	1	2	2	10	+0.5	2v	1	2	2	12	+0.5	2v	1	2	2	12	+0.6	2	1	2	2	12	+0.6	2	1	2	2	12	+0.5	2	1	2	2	16	+0.5	2	1	2	2	16	10	0.6	4	4	4	1	No
20	1	–	–	1	2	–	+1.98	2v	1	2	1	10	+1.77	2v	1	2	1	12	+1.77	2v	1	2	1	12	+1.0	2	1	2	2	14	+1.0	2	1	2	2	14	+0.8	2	1	2	2	14	+0.8	2	1	2	2	16	13	0.8	5	5	5	2	1
21	1	–	–	4	2	-	+2.28	2v	1	2	1	8	+2.28	2v	1	2	2	12	+2.28	2v	1	2	2	12	+1.77	2	1	2	2	12	+1.77	2	1	2	2	12	+1.77	2	1	2	2	12	+1.77	2	1	2	2	14	13	0.9	7	7	7	2	1
22	1	–	–	1	2	–	+0.8	3v	1	2	2	8	+0.8	3v	1	2	2	10	+0.8	3v	1	2	2	10	+0.8	2	1	1	1	12	+0.8	2	1	1	1	12	+0.5	2	1	2	2	14	+0.5	2	1	2	2	10	15	0.6	4	4	4	2	No
23	2	1	1 y	1	2	–	+0.5	2v	1	2	2	10	+0.5	2v	1	2	2	12	+0.5	2v	1	2	2	12	+0.3	2	1	2	2	12	+0.3	2	1	2	2	12	+0.5	2	1	2	2	14	+0.5	2	1	2	2	14	13	0.9	6	6	6	2	No
24	2	–	–	1	2	–	+0.5	3v	1	2	2	5	+0.6	3v	1	2	2	16	+0.6	3v	1	2	2	16	+0.5	2	1	2	2	18	+0.5	2	1	2	2	18	+0.3	2	1	2	2	14	+0.3	2	1	2	2	14	12	0.7	4	4	4	2	2
25	1	–	–	3	2	–	+2.28	3v	1	2	1	20	+2.28	3v	1	2	1	24	+2.28	3v	1	2	1	24	+2.28	3v	1	2	1	28	+2.28	3v	1	2	1	28	+2.28	3v	1	2	1	26	+2.28	3v	1	2	2	28	13	0.8	7	7	7	1	4
26	3	1	1 y	2	1	1	+0.8	2v	1	2	2	10	+0.8	2v	1	2	2	12	+0.8	2v	1	2	2	12	+0.6	2	1	2	2	14	+0.6	2	1	2	2	14	+0.6	2	1	2	2	12	+0.6	2	1	2	2	10	15	0.6	4	4	4	2	3
27	1	1	2 m	2	2	–	+2.28	3v	1	2	1	28	+2.28	3v	1	2	1	26	+2.28	3v	1	2	1	26	+1.77	2	1	2	2	16	+1.77	2	1	2	2	16	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	12	0.9	5	5	5	1	1,3,4
28	2	–	–	1	2	–	+0.5	2v	1	2	2	14	+0.0	2v	1	2	2	16	+0.0	2v	1	2	2	16	+0.0	2	1	2	2	16	+0.0	2	1	2	2	16	+0.0	2	1	2	2	12	+0.0	2	1	2	2	12	12	0.8	6	6	6	2	No
29	2	2	3 m	1	2	–	+1.17	2v	1	2	1	10	+1.07	2v	1	2	1	14	+1.07	2v	1	2	1	14	+0.8	2	1	2	2	16	+0.8	2	1	2	2	16	+0.8	2	1	2	2	10	+0.8	2	1	2	2	10	12	0.8	4	4	4	2	1
30	2	1,5	2 y	3	2	–	+1.0	2v	1	2	2	24	+0.6	2v	1	2	2	24	+0.6	2v	1	2	2	24	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	+0.6	2	1	2	2	18	+0.6	2	1	2	2	16	13	0.9	5	5	5	2	4
31	2	1	1 m	2	1	1	+0.2	2v	1	2	2	12	+0.2	2v	1	2	2	14	+0.2	2v	1	2	2	14	+0.2	2	1	2	2	16	+0.2	2	1	2	2	16	+0.2	2	1	2	2	16	+0.2	2	1	2	2	16	12	0.9	5	5	5	2	No
32	2	–	–	2	2	–	+1.17	2v	1	1	1	4	+0.8	2v	1	2	2	12	+0.8	2v	1	2	2	12	+0.6	2	1	2	2	14	+0.6	2	1	2	2	14	+0.6	2	1	2	2	14	+0.6	2	1	2	2	16	13	0.7	5	5	5	2	2,5,6,7
33	2	1,2	2 y	1	2	–	+1.301	3v	1	2	1	8	+1.0	3v	1	2	2	10	+1.0	3v	1	2	2	10	+0.6	2	1	2	2	8	+0.6	2	1	2	2	8	+0.5	2	1	2	2	10	+0.5	2	1	2	2	12	11	0.7	4	4	4	2	7
34	1	–	–	2	2	–	+2.28	3v	1	2	1	24	+1.77	3v	1	2	2	10	+1.77	3v	1	2	2	10	+1.77	2	1	2	2	10	+1.77	2	1	2	2	10	+1.77	2	1	2	2	12	+1.77	2	1	2	2	12	13	0.9	7	7	7	2	1, 3, 6,
35	1	–	–	2	1	1	PL	2v	1	2	1	28	PL	2v	1	2	1	10	PL	2v	1	2	1	10	PL	2	1	2	2	12	PL	2	1	2	2	12	PL	2	1	2	2	12	PL	2	1	2	2	14	13	0.9	7	7	7	2	1
36	3	1	1 y	2	1	1	PL	2v	1	1	1	4	+2.28	2v	1	2	2	12	+2.28	2v	1	2	2	12	+1.77	2	1	2	2	12	+1.77	2	1	2	2	12	+1.77	2	1	2	2	14	+1.77	2	1	2	2	14	13	0.8	5	5	5	2	1,2,5
37	1	–	–	1	2	–	+0.8	2v	1	2	2	8	+0.6	2v	1	2	2	10	+0.6	2v	1	2	2	10	+0.6	2	1	2	2	10	+0.6	2	1	2	2	10	+0.6	2	1	2	2	10	+0.6	2	1	2	2	12	13	0.8	5	5	5	2	No
38	1	–	–	2	1	1	+0.8	3v	1	2	2	14	+0.3	3v	1	2	2	12	+0.3	3v	1	2	2	12	+0.3	3	1	2	2	12	+ 0.3	3	1	2	2	14	+ 0.3	3	1	2	2	16	13	0.7	5	5	5	2	No

Eye	duration of glaucoma	type of Medication	Duration of AGM	Type of glaucoma	PI	Patency	DAY 1						DAY 5						Day 10						1 Month						3 Month						6 Month						1 year						post op IOP 1 yr	target iop	CDR at 1 yr	field at presentation	field 6 months	field I year	postop AGM use	Complications
							BCVA	Morphology of bleb	PI Patency	AC depth	Corneal edema	IOP	BCVA	Morphology of bleb	PI patency	AC Depth	Corneal edema	IOP	BCVA	Morphology of bleb	PI patency	AC Depth	Corneal edema	IOP	Bcva	Morphology of bleb	PI Patency	AC Depth	Corneal edema	IOP	Bcva	Morphology of bleb	PI Patency	AC Depth	Corneal edema	IOP	BCVA	Morphology of Bleb	PI Patency	AC Depth	Corneal Edema	IOP	BCVA	Morphology of Bleb	PI Patency	AC Depth	Corneal Edema	IOP							
39	1	–	–	2	2	–	PL	2v	1	2	2	30	PL	2v	1	2	2	28	PL	2v	1	2	2	28	PL	2	1	2	2	16	PL	2	1	2	2	16	PL	2	1	2	2	16	PL	2	1	2	2	16	13	0.9	7	7	7	2	4
40	1	–	–	1	2	–	+1.0	2v	1	2	2	8	+0.8	2v	1	2	2	10	+0.8	2v	1	2	2	10	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	11	0.9	5	5	5	2	No
41	1	–	–	1	2	–	RE +0.6	2v	1	2	2	8	+0.6	2v	1	2	2	10	+0.6	2v	1	2	2	10	+0.3	2	1	2	2	10	+0.3	2	1	2	2	10	+0.3	2	1	2	2	12	+0.3	2	1	2	2	12	12	0.9	5	5	5	1	No
42	1	_	_	1	2	_	LE +0.8	2v	1	2	2	5	+0.6	2v	1	2	2	12	+0.6	2v	1	2	2	12	+0.2	3	1	2	2	12	+0.2	3	1	2	2	12	+0.2	3v	1	2	2	10	+0.2	3v	1	2	2	18	12	0.8	5	5	5	1	2
43	1	–	–	1	2	–	+1.0	2v	1	2	2	8	+0.6	2v	1	2	2	18	+0.6	2v	1	2	2	18	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	+0.6	2	1	2	2	14	13	0.8	6	6	6	2	No
44	1	1,2	1 m	1	2	–	+0.5	2v	1	2	2	8	+0.5	2v	1	2	2	12	+0.5	2v	1	2	2	12	+0.3	2	1	2	2	14	+0.3	2	1	2	2	14	+0.3	3	1	2	2	14	+0.3	3	1	2	2	14	13	0.9	6	6	6	2	No
45	1	–	–	1	2	–	RE +0.8	2v	1	2	2	8	+0.8	2v	1	2	2	8	+0.8	2v	1	2	2	8	+0.8	2	1	2	2	16	+0.8	2	1	2	2	16	+0.8	2v	1	2	2	16	+0.8	2v	1	2	2	16	12	0.8	4	4	4	1	No
46	1	_	_	1	2	_	LE +1.0	2v	1	2	2	8	+0.8	2v	1	2	2	10	+0.8	2v	1	2	2	10	+0.8	2	1	2	2	14	+0.8	2	1	2	2	14	+0.8	2v	1	2	2	16	+0.8	2v	1	2	2	16	12	0.8	4	4	4	1	No
47	1	–	–	3	2	–	+0.5	3v	1	2	2	12	+0.5	3v	1	2	2	12	+0.5	3v	1	2	2	12	+0.2	2	1	2	2	32	+0.2	2	1	2	2	30	+0.2	3	1	2	2	32	+0.2	3	1	2	2	30	15	0.7	4	4	4	1	4
48	1	1,2	3 m	1	2	–	+0.3	3v	1	2	2	10	+0.3	3v	1	2	2	12	+0.3	3v	1	2	2	12	+0.0	3	1	2	2	12	+0.0	3	1	2	2	12	+0.0	3v	1	2	2	20	+0.0	3v	1	2	2	12	13	0.7	5	5	5	1	No
49	1	1,2	3 m	1	2	–	LE No PL	2v	1	2	2	14	No PL	2v	1	2	2	28	No PL	2v	1	2	2	28	No PL	3	1	2	2	24	No PL	3	1	2	2	24	No PL	3v	1	2	2	40	No PL	3	1	2	2	28	13	0.9	7	7	7	1	4
50	1	1,2	3m	1	2	_	+0.77	5	1	2	2	12	+0.6	5	1	2	2	12	+0.6	5	1	2	2	12	+0.6	2	1	2	2	14	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	15	0.5	4	4	4	2	6
51	1	–	–	3	2	–	+0.6	2v	1	2	2	8	+0.5	2v	1	2	2	10	+0.5	2v	1	2	2	10	+0.5	2	1	2	2	14	+0.5	2	1	2	2	14	+0.6	2	1	2	2	12	+0.6	2	1	2	2	10	13	0.9	6	6	6	2	No
52	1	–	–	3	2	–	+1.301	2v	1	2	1	8	+1.07	2v	1	2	2	12	+1.07	2v	1	2	2	12	+1.0	2	1	2	2	14	+1.0	2	1	2	2	14	+1.0	2	1	2	2	14	+1.0	2	1	2	2	14	13	0.7	5	5	5	2	1, 3
53	1	_	_	1	2	_	+1.77	2v	1	2	2	10	+1.77	2v	1	2	2	16	+1.77	2v	1	2	2	16	+1.77	2	1	2	2	18	+1.77	2	1	2	2	18	+1.77	2	1	2	2	16	+1.77	2	1	2	2	14	13	0.9	7	7	7	2	No
54	1	1,4	8m	2	1	1	+0.77	2v	1	2	2	10	+0.6	2v	1	2	2	16	+0.6	2v	1	2	2	16	+0.6	2	1	2	2	14	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	13	0.7	5	5	5	2	No
55	2	_	_	1	2	_	+0.77	2v	1	2	2	8	+0.6	2v	1	2	2	14	+0.6	2v	1	2	2	14	+0.6	2	1	2	2	14	+0.6	2	1	2	2	14	+0.4	2	1	2	2	14	+0.4	2	1	2	2	16	11	0.7	5	5	5	2	No
56	2	_	_	1	2	_	+0.77	2v	1	2	2	8	+0.4	2v	1	2	2	10	+0.4	2v	1	2	2	14	+0.4	2	1	2	2	14	+0.4	2	1	2	2	16	+0.4	2	1	2	2	16	+0.4	2	1	2	2	18	12	0.6	4	4	4	2	NO
57	1	1,4	3 m	1	2	–	PL	3v	1	2	2	8	PL	3v	1	2	2	10	PL	3v	1	2	2	10	PL	2	1	2	2	14	PL	2	1	2	2	14	PL	2	1	2	2	14	PL	2	1	2	2	16	13	0.9	7	7	7	2	No
58	1	–	–	1	2	–	+1.98	2v	1	2	1	10	+1.77	2v	1	2	1	12	+1.77	2v	1	2	1	12	+1.0	2	1	2	2	14	+1.0	2	1	2	2	14	+1.0	2	1	2	2	16	+1.0	2	1	2	2	16	13	0.8	5	5	5	2	1
59	2	1	1 y	1	2	–	+0.5	2v	1	2	2	5	+0.5	2v	1	2	2	12	+0.5	2v	1	2	2	12	+0.3	2	1	2	2	12	+0.3	2	1	2	2	12	+0.3	2	1	2	2	12	+0.3	2	1	2	2	16	13	0.9	6	6	6	2	2
60	2	–	–	2	1	1	+1.17	2v	1	1	1	4	+0.8	2v	1	2	2	12	+0.8	2v	1	2	2	12	+0.6	2	1	2	2	14	+0.6	2	1	2	2	14	+0.6	2	1	2	2	16	+0.6	2	1	2	2	16	13	0.7	5	5	5	2	2,5,6,7
61	1	–	–	2	1	2	PL	2v	1	2	1	28	PL	2v	1	2	1	10	PL	2v	1	2	1	10	PL	2	1	2	2	12	PL	2	1	2	2	12	PL	2	1	2	2	14	PL	2	1	2	2	14	13	0.9	7	7	7	2	1
62	3	1	1 y	2	1	1	PL	2v	1	1	1	4	+2.28	2v	1	2	2	12	+2.28	2v	1	2	2	12	+1.77	2	1	2	2	12	+1.77	2	1	2	2	12	+1.77	2	1	2	2	10	+1.77	2	1	2	2	14	13	0.8	5	5	5	2	1,2,5
63	1	–	–	1	2	–	+0.8	2v	1	2	2	8	+0.6	2v	1	2	2	10	+0.6	2v	1	2	2	10	+0.6	3	1	2	2	10	+0.6	3	1	2	2	12	+0.6	3v	1	2	2	10	+0.6	3v	1	2	2	14	13	0.8	5	5	5	2	No
64	2	–	–	1	2	–	+1.17	2v	1	1	1	8	+0.8	2v	1	2	2	8	+0.8	2v	1	2	2	12	+0.6	2	1	2	2	14																											5				5,6,7
65	1	2	2 y	2	1	1	+1.0	2v	1	2	2	8	+1.0	2v	1	2	2	8	+1.0	2v	1	2	2	8	+1.0	2	1	2	2	10																											5				3
66	2	_	_	1	2	_	+0.77	2v	1	2	2	8	+0.6	2v	1	2	2	14	+0.6	2v	1	2	2	14	+0.6	2	1	2	2	14	+0.6	2	1	2	2	14	+0.6	2	1	2	2	12	+0.6	2	1	2	2	16	11	0.7	5	5	5	1	No
67	1	–	–	1	2	–	+0.8	3v	1	2	2	10	+0.3	3v	1	2	2	14	+0.3	3v	1	2	2	14	+0.2	2	1	2	2	18	+0.2	2	1	2	2	18	+0.2	3v	1	2	2	16	+0.2	3v	1	2	2	18	13	0.7	5	5	5	2	No
68	1	–	–	1	2	–	+0.8	3v	1	2	2	10	+0.3	3v	1	2	2	14	+0.3	3v	1	2	2	14	+0.2	2	1	2	2	18	+0.2	2	1	2	2	14	+0.2	2	1	2	2	16	+0.2	2	1	2	2	18	13	0.7	5	5	5	1	No
69	2	1,2	1 m	1	2	–	+0.5	2v	1	2	2	8	+0.5	2v	1	2	2	12	+0.5	2v	1	2	2	12	+0.3	2	1	2	2	14	+0.3	2	1	2	2	16	+0.3	2	1	2	2	16	+0.3	2	1	2	2	16	12	0.9	5	5	5	2	No
70	3	1	1 y	2	1	1	+0.8	3v	1	2	2	10	+0.8	3v	1	2	2	12	+0.8	3v	1	2	2	12	+0.6	3	1	2	2	14	+0.6	3	1	2	2	14	+0.6	3v	1	2	2	12	+0.6	3v	1	2	2	18	15	0.6	4	4	4	2	3
71	1	2	9m	1	2	–	+0.8	2v	1	2	2	12	+0.6	2v	1	2	2	12	+0.6	2v	1	2	2	12	+0.2	2	1	2	2	14	+0.2	2	1	2	2	12	+0.2	2	1	2	2	16	+0.2	2	1	2	2	16	13	0.9	5	5	5	2	No
72	2	1	6 m	1	2	–	RE +0.8	2v	1	2	1	5	RE +0.6	2v	1	2	2	6	RE +0.6	2v	1	2	2	6	RE +0.3	2	1	2	2	11	RE +0.3	2	1	2	2	11	+0.3	2	1	2	2	16	+0.3	2	1	2	2	12	12	0.9	6	6	6	2	2
73	1	–	–	1	2	–	+0.8	2v	1	2	2	10	+0.3	2v	1	2	2	14	+0.3	2v	1	2	2	14	+0.2	2	1	2	2	18	+0.2	2	1	2	2	18	+0.2	2	1	2	2	12	+0.2	2	1	2	2	16	13	0.7	5	5	5	2	No
74	2	1	6 m	1	2	–	RE +0.8	3v	1	2	1	5	RE +0.6	3v	1	2	2	6	RE +0.6	3v	1	2	2	6	RE +0.3	2	1	2	2	11	RE +0.3	2	1	2	2	16	+ 0.3	2	1	2	2	12	+ 0.3	2	1	2	2	16	12	0.8	6	6	6	1	2,7
75	2	1	6m	1	2	_	+0.8	3v	1	2	2	8	LE +0.8	3v	1	2	2	12	+0.8	3v	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	14	+ 0.8	2	1	2	2	16	+ 0.8	2	1	2	2	14	12	0.8	6	6	6	1	No

Eye	duration of glaucoma	type of Medication	Duration of AGM	Type of glaucoma	PI	Patency	DAY 1						DAY 5						Day 10						1 Month						3 Month						6 Month						1 year						post op IOP 1 yr	target iop	CDR at 1 yr	field at presentation	field 6 months	field I year	postop AGM use	Complications
							BCVA	Morphology of bleb	PI Patency	AC depth	Corneal edema	IOP	BCVA	Morphology of bleb	PI patency	AC Depth	Corneal edema	IOP	BCVA	Morphology of bleb	PI patency	AC Depth	Corneal edema	IOP	Bcva	Morphology of bleb	PI Patency	AC Depth	Corneal edema	IOP	Bcva	Morphology of bleb	PI Patency	AC Depth	Corneal edema	IOP	BCVA	Morphology of Bleb	PI Patency	AC Depth	Corneal Edema	IOP	BCVA	Morphology of Bleb	PI Patency	AC Depth	Corneal Edema	IOP							
76	1	–	–	1	2	–	+1.0	2v	1	2	2	8	+0.8	2v	1	2	2	10	+0.8	2v	1	2	2	10	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	11	0.9	5	5	5	2	No
77	2	–	–	2	1	2	+0.8	2v	1	2	2	5	+0.8	2v	1	2	2	8	+0.8	2v	1	2	2	8	+0.8	2	1	2	2	12	+0.8	2	1	2	2	12	+0.8	2	1	2	2	14	+0.8	2	1	2	2	12	13	0.9	6	6	6	2	2
78	2	2	3 m	1	2	–	+1.17	2v	1	2	1	10	+1.07	2v	1	2	1	14	+1.07	2v	1	2	1	14	+0.8	2	1	2	2	16	+0.8	2	1	2	2	16	+0.8	2	1	2	2	16	+0.8	2	1	2	2	14	12	0.8	4	4	4	1	1
79	1	_	_	4	2	–	PL	2v	1	2	2	8	PL	2v	1	2	2	12	PL	2v	1	2	2	12	PL	2	1	2	2	14	PL	2	1	2	2	14	PL	2	1	2	2	12	PL	2	1	2	2	14	13	0.9	7	7	7	2	3
80	1	–	–	3	2	–	+1.301	2v	1	2	1	8	+1.07	2v	1	2	2	12	+1.07	2v	1	2	2	12	+1.0	2	1	2	2	14	+1.0	2	1	2	2	14	+1.0	2	1	2	2	16	+1.0	2	1	2	2	14	13	0.7	5	5	5	2	1,6
81	1	_	_	1	2	_	+1.77	2v	1	2	2	10	+1.77	2v	1	2	2	16	+1.77	2v	1	2	2	16	+1.77	2	1	2	2	18	+1.77	2	1	2	2	18	+1.77	2	1	2	2	16	+1.77	2	1	2	2	18	13	0.9	7	7	7	1	No
82	2	1,4	2 yr	2	1	1	+2.28	3v	1	2	2	10	+0.77	3v	1	2	2	10	+0.77	3v	1	2	2	10	+0.60	2	1	2	2	12	+0.60	2	1	2	2	16	+0.60	2	1	2	2	12	+0.60	2	1	2	2	12	13	0.9	5	5	5	1	3,5
83	2	1,4	2 yr	2	1	1	0.47	3v	1	2	2	8	+0.47	3v	1	2	2	10	+0.47	3v	1	2	2	12	+0.47	2	1	2	2	14	+0.47	2	1	2	2	14	+0.47	2	1	2	2	12	+0.47	2	1	2	2	12	13	0.9	5	5	5	2	No